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Yaquina Head: A Middle Archaic Settlement on the North-Central Oregon Coast

Rick Minor

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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YAQUINA HEAD:
A MIDDLE ARCHAIC SETTLEMENT
ON THE NORTH-CENTRAL OREGON COAST

by

Rick Minor

with contributions by

Debra C. Barner
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Report to

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Foreward

Publication of this volume marks the end of the third phase of archaeological assessments and data recovery of prehistoric sites at Yaquina Head. At this time, no further archaeological work is anticipated at the headland. The first and third volumes of this cultural resource publication series reported on the first two phases of fieldwork. The findings of this more recent exploration has provided substantial new information, thus allowing refinement and modification of previously offered interpretations. The BLM now looks forward to making use of this information and the resultant artifact assemblages for interpretive exhibits. These exhibits will be developed to enhance the public's awareness and appreciation of the Indian cultures that made use of the coastal area resources for millennia.

Richard C. Hanes
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ABSTRACT

In conjunction with development of the Yaquina Head Interpretive Center, archaeological investigations were sponsored by the Bureau of Land Management at site 35LNC62 at the tip of Yaquina Head on the north-central Oregon coast. These investigations were designed to (1) mitigate impacts to areas to be directly affected by proposed developments, and (2) obtain comprehensive data on the extent and nature of the prehistoric cultural deposits in order to provide for the long-term management and protection of the archaeological site.

The 1989 investigations involved auger testing and unit excavations in three areas. Area A includes the shell midden exposed along the headland's north face, where excavations were previously conducted in 1986. Area B is a small, spatially discrete shell midden to the south that was discovered during the auger testing program. Area C encompasses remnant sand dunes located to the southeast of the two shell middens; only sparse evidence of occupation was encountered there.

Excavations established that the structure of the archaeological deposits is the same in both areas A and B, with the shell middens (Stratum 2) bound by non-shell cultural deposits above (Stratum 1) and below (Stratum 3). Previous investigations in Area A had suggested that cultural materials from Stratum 3 could be distinguished as a separate cultural component (Yaquina I) from cultural materials from Strata 1 and 2 (Yaquina II). The results of the 1989 excavations indicate that these component definitions are no longer appropriate. Additional radiocarbon dates indicate that prehistoric use of 35LNC62 involved overlapping occupations, both between strata and between areas of the site. As a result, the two cultural components distinguished on the basis of the 1986 investigations have melded into one occupation sequence.

The chronology of occupation at 35LNC62 has been established with the aid of 22 radiocarbon dates. The four earliest assays are believed to relate to natural fires before initial use of the headland by prehistoric peoples. Radiocarbon assays from Stratum 3 of 4100 ± 60 RCYBP from Area A and 4050 ± 60 RCYBP are considered the most relibable dates for initial occupation. The first intensive exploitation of shellfish is dated by radiocarbon assays of 3670 ± 70 RCYBP from Area B and 3270 ± 70 RCYBP from Area A. While a basal stratum of non-shell occupation may be represented, it is now clear that relatively little time elapsed before intensive shellfish exploitation began. The latest radiocarbon assay is 2310 ± 60 RCYBP from Stratum 1 in Area A, and 35LNC62 is believed to have been abandoned by 2000 years ago.

Several lines of evidence (e.g., remains of a house, presence of human burials, seasonality of faunal remains) lead to the conclusion that 35LNC62 served as a village during most of its occupation span. Environmental reconstruction suggests that the setting during the occupation of the site was considerably different than today. A sand apron probably existed below the headland, making access to the beach considerably easier than it is today. Coniferous forest also existed on the headland 4000 years ago. Speculation as to the reasons for abandonment of the site focus on two factors: (1) erosion of the hypothesized sand apron, resulting in greater difficulty in access to the shoreline; and (2) reduction in tree cover, resulting in greater exposure to the fierce winds characteristic of the Oregon coast.

Radiocarbon dating places the bulk of the occupation at 35LNC62 during the Middle Archaic interval from 3500 to 1500 BP. Occupation during this interval represents an earlier cultural pattern on the Southern Northwest Coast before the emergence of ethnographic cultures during the Late Archaic period (1500 BP to historic contact). As the most extensively investigated Middle Archaic settlement so far reported in this region, information obtained from 35LNC62 has contributed directly to clarifying the nature of prehistoric cultural adaptations during Middle Archaic times. The information obtained from 35LNC62, particularly the faunal evidence suggesting exploitation of marine resources offshore, is consistent with other recent studies indicating that the prehistoric population along the Southern Northwest Coast was more technologically sophisticated and dynamic than has been previously suggested.

PREFACE AND ACKNOWLEDGEMENTS

The archaeological research at 35LNC62 in 1989 described in this report was the third in a series of investigations at Yaquina Head carried out by Heritage Research Associates, Inc. under contract with the Bureau of Land Management. The first project, in 1986, consisted of salvage excavations along the portion of 35LNC62 subject to severe erosion. The second project, more limited in scope, involved excavations in 1988 at 35LNC50 on the north side of the headland in order to offset impacts from fence construction.

Throughout the Yaquina Head projects, the same interdisciplinary research team has been employed. Rick Minor and Kathryn Anne Toepel were in overall charge of the field investigations. Patricia F. McDowell conducted geomorphological research. Debra C. Barner carried out studies of molluscan remains. Ruth L. Greenspan and Rebecca J. Wigen analyzed the vertebrate faunal remains, with assistance from Scott Dano on the 1989 assemblage. Brian E. Hemphill identified human skeletal remains. The affiliations and specific contributions of each individual are provided in the List of Contributors and the Table of Contents in this report.

The 1989 investigations at Yaquina Head were carried out under the terms of Contract No. OR952-CT9-2085 with the Bureau of Land Management, Oregon State Office. Frances M. Philipek served as Contracting Officer's Representative, while Rick Minor served as Principal Investigator for Heritage Research Associates, Inc. Fieldwork began on June 5 and concluded on August 14, 1989. The fieldwork was directed by Robert R. Musil, and the field crew included John Boughton, Ben Breon, Jr., Walter Crayton, Sheila C. Musil, Lynn Peterson, Julie Ricks, Ruth Woodcook, and Robert Wenger. Mary Viles of the Confederated Tribes of Siletz Indians was in charge of public relations during the project.

Charcoal recovered during the 1989 investigations at Yaquina Head was identified by Nancy A. Stenholm of Botana Labs, Seattle, Washington. Soil samples were analyzed for pollen content by Mary Edwards of the University of Alaska, Fairbanks. Advice in the classification of bone/antler artifacts was provided by Don E. Dumond of the University of Oregon. Brian E. Hemphill assisted in the statistical analysis of the radiocarbon dates. The photograph of Yaquina Head on the report cover was provided by Bob Staley of Eugene, Oregon.

Artifact illustrations were drawn by Kevin McCornack, and maps and profiles were prepared by Douglas Deur. Final responsibility for production of this report was assumed by Kathryn Anne Toepel. At the conclusion of this project, the field notes, artifacts, and faunal collections from the 1989 investigations at Yaquina Head were deposited for curation at the Oregon State Museum of Anthroplogy, University of Oregon, under Accession No. 698.

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CHAPTER 1

INTRODUCTION

This volume presents the results of investigations in 1989 at archaeological site 35LNC62 on Yaquina Head, a prominent headland on the north-central Oregon coast. Previous research in 1986 established that Yaquina Head was the setting of an extensive prehistoric settlement occupied most intensively from approximately 3200 years ago until its abandonment sometime before 2000 years ago. With a well documented occupation spanning more than a thousand years, the settlement on Yaquina Head represents one of the oldest archaeological sites known along the Oregon coast.

Native peoples of the Oregon coast practiced a way of life that was a variant of Northwest Coast culture, which developed along the Pacific Coast from southeast Alaska to northern California. Northwest Coast culture is famous world-wide for attaining a stage of cultural complexity rivaled only by agricultural peoples (Suttles 1968a:56). Cultural developments along the North Pacific Coast were based on a sophisticated hunting-fishing-gathering economy supported by well-developed food preservation techniques. Variations in lifeways along the Northwest Coast reflected adaptations to locally available natural resources as well as the separate historical experiences of the individual native groups within the region (Suttles 1968b; Schalk 1982).

The time depth of Northwest Coast culture has not been firmly established, especially in the southern portion of the culture area along the southern Washington, Oregon, and northern California coast. In this respect, the results of investigations at 35LNC62 are highly important, as they provide a view of an earlier stage of Northwest Coast cultural development. The most intensive occupation of this settlement occurred during what has been referred to as the Middle Archaic stage, approximately 3500-1500 years ago (Minor 1989a). According to currently available evidence, it was during this period that prehistoric populations closely adapted to coastal resources became widely established along the Southern Northwest Coast. As is the case at most other Middle Archaic sites, occupation at 35LNC62 ended before the beginning of the Late Archaic, which witnessed the emergence of the ethnographic cultures of the region.

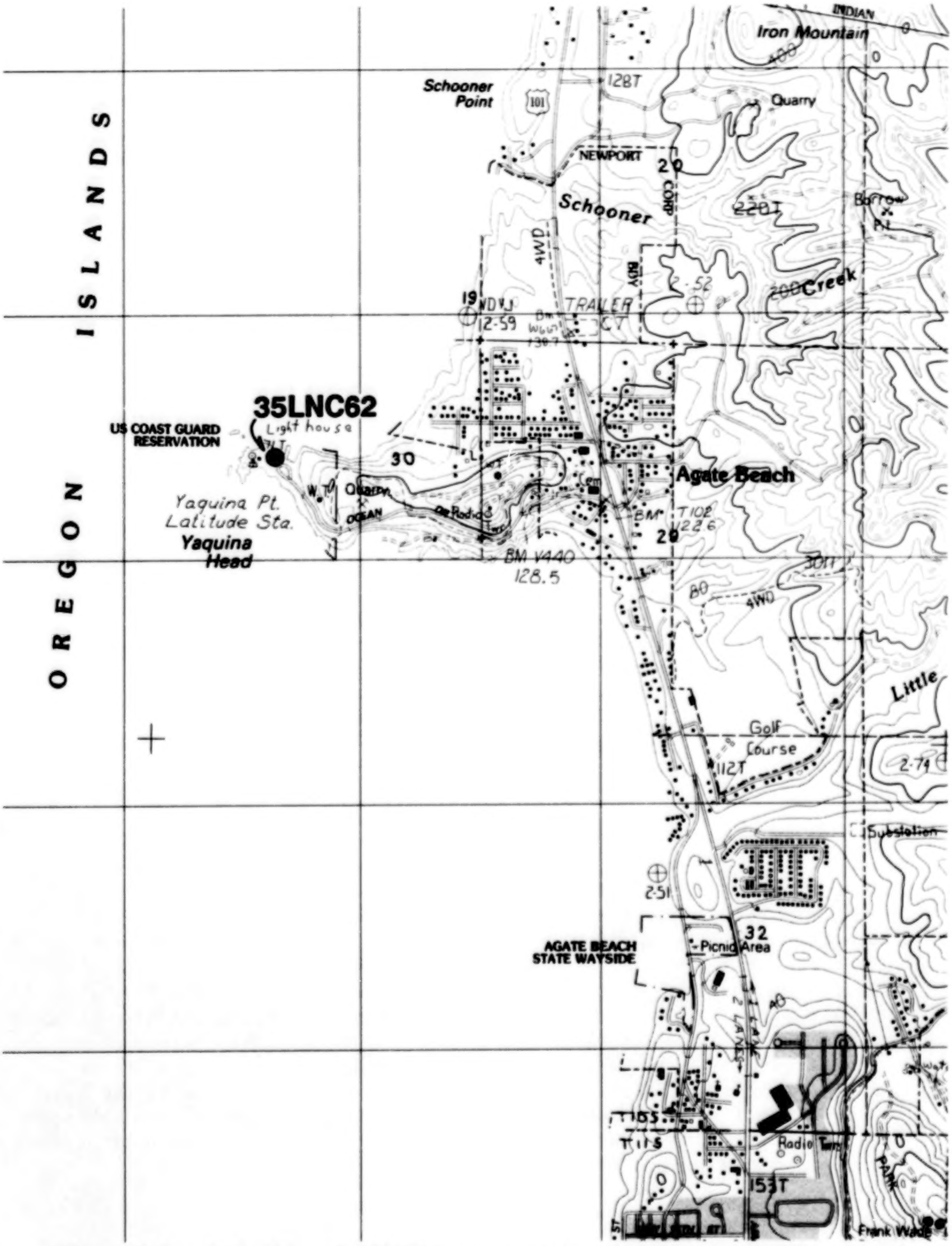

Figure 1-1. Location of 35LNC62 north of Newport on the north-central Oregon coast (USGS Newport North 7-1/2' quadrangle, 1984).

LOCATION AND SETTING

Yaquina Head, located 5 km north of the city of Newport in Lincoln County, is famous as the location of the tallest active lighthouse along the Oregon coast (Figure 1-1). The station was built in 1872-1873, and the light first displayed its beacon on August 20, 1873. The lighthouse and an associated residential complex (Figure 1-2) were operated by the U.S. Coast Guard until 1976. Eventually, all residential structures were removed, and the now automated lighthouse became part of the Yaquina Head Outstanding Natural Area administered by the Secretary of the Interior through the Bureau of Land Management.

Site 35LNC62 is located on the exposed narrow tip of Yaquina Head, with the Pacific Ocean to the north, west, and south. The site extends across the top of the headland from the north to the south face. Previous investigations established that the lighthouse residential area was constructed over a portion of the archaeological site. As viewed today, the archaeological site is situated roughly between the lighthouse and the visitors' parking lot. A low volume spring, located on the headland approximately 120 m to the east of the site, provided fresh water during the lighthouse occupation, and was presumably used by the prehistoric inhabitants of Yaquina Head as well.

The flora and fauna at Yaquina Head are rich and varied, and for this reason the headland was designated an Outstanding Natural Area by the U.S. Congress in 1980. Although the top of the headland around the lighthouse is now covered by grasses and clover introduced in historic times, native vegetation still present on the headland includes Sitka spruce and lodgepole pine trees, salal, and bracken fern. A variety of other plants are also found on the headland, including three of rare occurrence: Alaska rein orchid, seaside gold-fields, and sea kale (Table 1-1).

A wide range of fauna makes use of Yaquina Head and the surrounding area. The headland is an especially productive habitat for birds, as nine types of birds breed and rear young on the headland, while 37 types of birds use the headland during migratory flights or for wintering (Table 1-2). Harbor seals and sea lions rest on rocks at the base of the headland, and twice a year whales migrate close offshore. Kelp beds in the ocean below the headland support a wide range of nearshore fish, and salmon pass offshore in the adjacent ocean waters. Tide pools at the ocean's edge contain mussels, barnacles, and other molluscs, as well as a variety of other intertidal species.

ETHNOGRAPHIC INHABITANTS

Yaquina Head is located along a section of the Oregon coast that was occupied at the time of historic contact by the Yaquina Indians.

Table 1-1. Plant species known to occur within the Yaquina Head Outstanding Natural Area (after Bureau of Land Management 1983).

Shrubs

Nootka or wild rose
Salal
Twinberry
Himalayan blackberry*
Evergreen blackberry
Trailing blackberry

Trees

Sitka spruce
Lodgepole pine

Ferns

Bracken fern

Other Vascular Plants

False Lily-of-the-Valley
White clover*
Cow parsnip
Seaside tansy
Common thistle
Foxglove*
Pimpernel*
English plantain*
Buckhorn plantain*
Small fireweed
Oregon wild cucumber
Pink sea clover
Dwarf cow parsley
Seaside fleabane
Oxeye daisy*
Monkey flower
Field chickweed
Heal-all*
Plantain
Fireweed
Bitter dock*
Western buttercup
Seaside gold-fields
Blue-eyed grass
Hedge nettle
English daisy*
Yellow mustard*
Cleavers bedstraw
Tiger lily
Evergreen violet
Sea thrift
Rein orchid
Sea kale*
Ladies tresses

---

* introduced plants

The Yaquina, along with the neighboring Alsea to the south, spoke closely related dialects of a single language that alone constitutes the Alsean language family. This language family has in turn been traditionally placed in the Penutian linguistic phylum, suggesting distant linguistic ties with other Penutian speakers, such as the Siuslaw, Lower Umpqua, and Coos peoples to the south along the Oregon coast (Thompson 1973:993-994). Although initially recognized as separate groups, later ethnographers have come to treat the Yaquina and Alsea as a single cultural unit encompassed under the name Alsea (e.g., Barnett 1937; Drucker 1939).

Philip Drucker, who conducted ethnographic research on the Siletz Reservation in 1934, reported that "two short river valleys, the Alsea and Yaquina, and the ocean frontage between them, comprised the extent of Alsea territory" (Drucker 1939:69). Yaquina and Alsea territory was somewhat more specifically defined in the information collected for the unratified treaty of 1855, which indicates that the Yaquina occupied

Table 1-2. Birds occurring within the Yaquina Head Outstanding Natural Area (from Bureau of Land Management 1983).

Species	Abundance*	Species	Abundance*
Marine Birds Breeding at Yaquina Head			
Brandt's cormorant	C	Common murre	N
Pelagic cormorant	C	Pigeon guillemot	C
Black oystercatcher	U	Rhinoceros auklet	U
Glaucous-winged gull	C	Tufted puffin	U
Western gull	N		
Birds Using the Yaquina Head Area During Periods of Migration/Wintering			
Common loon	C	Western sandpiper	O
Arctic loon	U	Red phalarope	I
Red-throated loon	U	Northern phalarope	I
Red-necked grebe	U	Parasitic jaeger	I
Horned grebe	C	Glaucous-winged gull	N
Western grebe	N	Western gull	N
Brown pelican	C	Herring gull	X
Double-crested cormorant	C	Bonaparte's gull	C
Brandt's cormorant	C	Sabine's gull	I
Pelagic cormorant	C	Heermann's gull	O
Harlequin duck	I	Black-legged kittiwake	O
White-winged scoter	N	Common tern	I
Surf scoter	N	Arctic tern	X
Black scoter	C	Common murre	N
Black oystercatcher	U	Marbled murrelet	O
Surfbird	C	Ancient murrelet	I
Black turnstone	N	Cassin's auklet	O
Wandering tattler	U	Rhinoceros auklet	O
Western killdeer	X		

* N - numerous: 50 or more birds/observer/day
C - common: 11-49 birds/observer/day
U - uncommon: 1-10 birds/observer/day
O - occasional: not seen every day, but occurs regularly
I - irregular: abundance and/or occurrence fluctuates annually
X - unknown: too little information to determine abundance

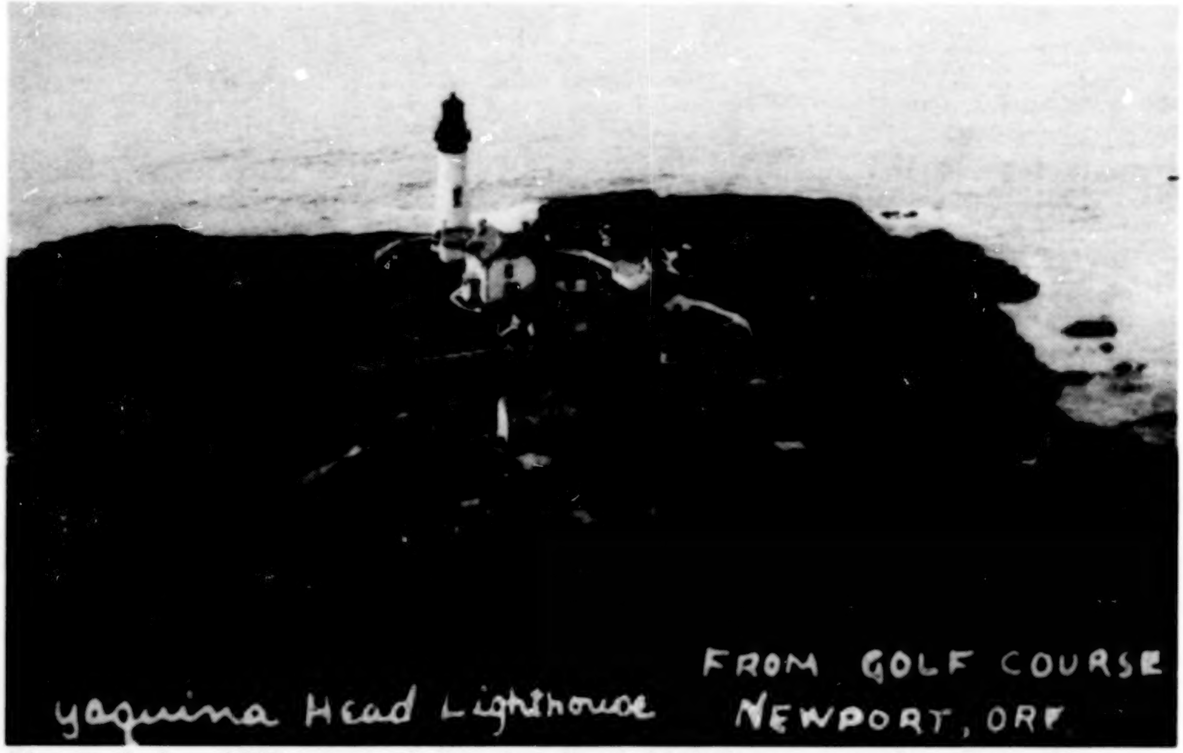

Figure 1-2. 1926 view of Yaquina Head lighthouse complex from the former golf course site at the top of the headland.

both sides of the Yaquina River from the coast to the crest of the Coast Range, some 30 km inland. The boundary between the Yaquina and Alsea was probably in the vicinity of Beaver Creek (Toepel and Beckham 1982:69). Alsea territory then extended south along the coast to Tenmile Creek north of present-day Florence, where the land of the Siuslaw Indians began. The neighbors of the Yaquina on the north were the Salish-speaking Tillamook. The exact point of southernmost Tillamook settlement is unclear, but it may have been in the vicinity of Otter Rock (Berreman 1937).

J. Owen Dorsey, who recorded ethnographic and linguistic information on the Yaquina and Alsea during a visit to the Siletz Reservation in 1884, compiled a list of the names of 56 Yaquina and 20 Alsea settlements, but most have no locational descriptions (Dorsey 1890:229-230). A few of the Yaquina settlements are vaguely located near Elk City and Newport, while Alsea sites are mentioned near Seal Rock, Beaver Creek, and Yachats. Drucker later added that "most of the villages, or at least the more important ones, were situated between the mouths of the rivers and the head of tidewater" (1939:81). Drucker's mention of "their seasonal migrations up and down their little valleys" (1939:82) suggests that the Yaquina and Alsea practiced subsistence procurement activities in a seasonal round. The picture that emerges from the sparse ethnographic information available, then, is of native peoples whose settlement and subsistence practices were bound for the most part to the limited confines of the Alsea and Yaquina river valleys (for a more complete review of Yaquina-Alsea culture, see Toepel and Beckham 1982).

While ethnographic records for the Yaquina and Alsea are admittedly incomplete, it is probably significant that 35LNC62 on Yaquina Head, one of the most prominent landmarks on the Oregon coast, is not mentioned in the surviving ethnography and folklore of the Yaquina and Alsea peoples (cf. Dorsey 1889, 1890; Farrand 1901; Frachtenberg 1917, 1920; Drucker 1939). The absence of references to this settlement in the ethnographic literature of the Yaquina and Alsea is not unreasonable, of course, in view of the chronological information indicating that it was abandoned by 2000 years ago. Together with the archaeological evidence, then, the absence of ethnographic references strongly suggests that 35LNC62 on the tip of Yaquina Head represents a different, earlier cultural pattern that apparently predates the emergence of ethnographic lifeways on the central Oregon coast.

PREVIOUS INVESTIGATIONS AT SITE 35LNC62

Although first identified in 1975 (Cole 1975), the archaeological site on the tip of Yaquina Head was not formally recorded as 35LNC62 until 1985 (Philipek 1985). The site was described as consisting of a "dense layer of midden material characterized by marine shellfish remains, fire-cracked rock, charcoal, mammal, bird and fish bone, antler, and lithic flakes" exposed along the eroding north face of the headland (Philipek 1986a). Ongoing erosion of the shell midden prompted the Bureau of Land Management to sponsor a program of archaeological investigations in 1986 (Philipek 1986b).

Fieldwork undertaken during the 1986 investigations included excavation of 14 1 x 1 m units dug to the bottom of the cultural deposit, resulting in the removal of 20.1 cubic meters of fill (Minor, Toepel, and Greenspan 1987). Since the principal objective of the investigations was to recover information from cultural deposits immediately threatened by erosion, these excavation units were concentrated along the headland's north face. Significantly, cultural materials were found to be present not only in the shell midden, but also in the surrounding non-shell-bearing deposits. Three basic cultural strata were recognized: Stratum 1, a dark eolian sand overlying the shell midden; Stratum 2, the shell midden itself; and Stratum 3, a lighter-colored silty loam underlying the shell midden.

In addition to the unit excavations, 13 auger holes were dug in order to trace the extent of the shell midden inland from the north cliff face. The shell midden was found to extend approximately 15 meters inland, but non-shell-bearing cultural deposits were found to be even more extensive. This situation thus indicates that there is considerably more to the archaeological site at the tip of Yaquina Head than the shell midden alone. The full extent of the cultural deposits was not determined during the 1986 investigations, but judging from the dark organic-rich nature of the sediments it appeared possible that evidence of occupation might be found more or less across the entire surface of the headland.

With the aid of 12 radiocarbon dates, two cultural components were defined at 35LNC62. The Yaquina I component was represented by cultural materials recovered from below the shell midden in Stratum 3 sediments. Artifacts from this stratum included only one chert core and 68 pieces of lithic debitage, but a range of vertebrate faunal remains were found, reflecting exploitation of a variety of terrestrial mammals, marine mammals, fish, and birds, during Yaquina I times. Radiocarbon dates suggested a timespan of perhaps 5000-3200 BP for the Yaquina I occupation. Considering the sparseness of the cultural remains, the site was thought to have been used as an occasional summer encampment during that period.

The Yaquina II component was represented by cultural materials from both the shell midden (Stratum 2) and the overlying non-shell-bearing cultural deposit (Stratum 1). Radiocarbon dates indicate that these two strata were deposited over essentially the same time span, and accordingly these strata were interpreted as representing different aspects of one occupation, rather than two sequential occupations. Overall a time range from 3200-2000 BP was suggested for the Yaquina II occupation. Seasonal indicators among both the molluscan and vertebrate faunal remains suggested that during this period the site was occupied more or less throughout the year. Certain cultural features, notably the outline of a semisubterranean pithouse observed in the north cliff face and the presence of two human burials, seemed to imply a relative degree of permanence in occupation. Considered altogether, the evidence led to the conclusion that the settlement on the tip of Yaquina Head served as a village during Yaquina II times.

The absence of later radiocarbon dates, as well as any temporally-diagnostic artifacts characteristic of late prehistoric occupation, suggests that 35LNC62 ceased to be occupied by around 2000 years ago. Abandonment of the settlement was most likely related in some fashion to ongoing erosion of the headland, which may have affected access to the intertidal zone below the headland and/or forest cover on the headland itself. Changes in either of these aspects of the local environment would have drastically reduced the advantages afforded by the settlement at the headland's tip. Subsequent use of Yaquina Head by native peoples apparently shifted to sites 35LNC49 and 35LNC50 situated to the northeast in the lee of the headland (Minor 1989b).

PROJECT OBJECTIVES

Previous investigations in 1986 were successful in obtaining basic information about the prehistoric settlement at the tip of Yaquina Head

(Minor et al. 1987). As is often the case in archaeological research, however, the results of these investigations raised numerous new questions about prehistoric use of this headland and, on a larger scale, about the general nature of prehistoric occupation along the Southern Northwest Coast. In this respect it was therefore fortunate that recreational development by the Bureau of Land Management for the Yaquina Head Interpretive Center led to further investigations at 35LNC62 in 1989.

The Yaquina Head Outstanding Natural Area receives approximately 250,000 visitors a year. In conjunction with development of the Yaquina Head Interpretive Center, improvements to the lighthouse area at the tip of the headland were also proposed, including regrading and paving of the dirt parking lot, fenceline construction, utility cable burial, and selection of locations for construction and placement of visitor facilities.

The objectives of the 1989 archaeological investigations at Yaquina Head were twofold. First, as a means of mitigating impacts to the archaeological site, data recovery excavations were to be conducted in the areas to be directly affected by specific proposed developments. Second, in order to effectively protect the natural values present, manage recreation facilities, and plan for, assess, and reduce or avoid impacts to 35LNC62, comprehensive data on the extent and nature of the prehistoric cultural deposits were to be obtained.

In accomplishing these objectives, the 1989 investigations were also carried out with the intent of addressing a number of specific research issues raised as a result of the previous archaeological research at Yaquina Head.

1. Previous geomorphological studies identified three broad stratigraphic units on the marine terraces at Yaquina Head. The two upper units were probably deposited within the period of human occupation on the coast. The nature of these deposits suggests that significant geomorphic changes have occurred in the Yaquina Head vicinity. Can the age of these stratigraphic units be established? What do these geomorphic changes imply for changes in the environment occupied by prehistoric peoples?

2. As indicated by the twelve radiocarbon dates already available, 35LNC62 contains materials, such as charcoal and bone, highly suitable for radiocarbon dating. All of these radiocarbon dates, however, were obtained from only one portion of what appears to be an extensive site. It is likely that other areas of the site, particularly those outside the shell deposits, may have been occupied at different times. Can the age of these other areas be established through radiocarbon dating?

3. Currently, relatively little is known about the Yaquina I occupation, estimated to date from 5,000 to 3,200 years ago, which occurs in Stratum 3 and precedes the shell midden accumulation. Is

additional evidence of the Yaquina I occupation present in other areas of the headland? Can additional artifactual and faunal evidence be found to flesh out the scanty record so far available for the early component?

4. The discovery of one apparent pithouse during the 1986 excavations suggests that 35LNC62 was a village during the Yaquina II occupation. At other coastal villages, the shell deposit is situated along the eroding cliff edge and the housepits are located inland. Are additional pithouses present in the areas to be affected by proposed developments at the site? On a broader scale, is the characterization of the Yaquina II occupation as a village accurate?

5. Since many of the archaeological sites so far investigated along the Southern Northwest Coast were occupied until the time of historic contact, the fact that 35LNC62 is thought to have been abandoned by 2000 years ago is highly noteworthy. Will more extensive excavations across the headland encounter evidence of occupation after 2000 BP? Will the acquisition of additional radiocarbon dates require revision in the estimated date of abandonment? Can additional evidence be found during the 1989 investigations to more fully explain why native peoples ceased to occupy the settlement at the tip of Yaquina Head?

REPORT ORGANIZATION

This report of the 1989 investigations at Yaquina Head consists of 10 chapters. Following this introduction, in Chapter 2 the geomorphology of Yaquina Head is described. Sedimentological and chemical data on the soils on the headland are presented, and the results of these analyses are interpreted in relation to the prehistoric occupation. Chapter 3 presents basic information on the excavation strategy and procedures, archaeological stratigraphy, and radiocarbon dating.

In Chapters 4 through 8 identification and analyses of various categories of cultural materials are described, including molluscan remains, vertebrate faunal remains, human skeletal remains, artifacts, and lithic debitage. The results of the site excavations and intrasite analyses are interpreted in Chapter 9. The volume concludes in Chapter 10 with a consideration of the prehistoric settlement at Yaquina Head within the broader context of Southern Northwest Coast prehistory.

CHAPTER 2

GEOMORPHOLOGY, SEDIMENTS, AND SOIL CHEMISTRY AT YAQUINA HEAD

by Patricia F. McDowell

This chapter focuses on the natural environmental history of Yaquina Head as revealed by geomorphic deposits and soils. In the first part, the geomorphic setting and natural sediment deposits in the vicinity of the headland are described. In the second part, the application of soil chemical analysis to questions concerning human influence on specific stratigraphic layers and features is discussed.

PREVIOUS GEOMORPHOLOGICAL INVESTIGATIONS

The prehistoric settlement recorded as 35LNC62 at Yaquina Head sits on a marine terrace that is much older than the archaeological remains. One major focus of the geomorphological research carried out in conjunction with the archaeological investigations was to document the stratigraphy and origin of deposits mantling the marine terrace and determine their relationships to the archaeological remains. Although there has been no systematic study of marine terraces on the Oregon coast, it is evident that their present landscapes were formed by a complex of erosional and depositional processes subsequent to initial terrace exposure resulting from lowered sea levels. Eolian deposits, including both dune sand (Cooper 1958) and eolian silt (Soil Conservation Service n.d.), are known to occur on marine terraces along the central Oregon coast.

During previous studies at 35LNC62 (McDowell 1987a), it was recognized that the marine terrace deposits are covered with younger eolian sand deposits, and that the archaeological remains occur within and above these younger deposits. In addition, older deposits of possible marine terrace and eolian origin were recognized on higher and older parts of Yaquina Head. Subsequent studies at nearby prehistoric site 35LNC50 (McDowell 1989) revealed an eolian silt layer that lies on top of the marine terrace deposits. The relationship of this silt layer to deposits at 35LNC62 was not clear, however.

The goals of the 1989 geomorphological research at 35LNC62 were (1) to establish the stratigraphic relationships among the marine terrace deposits, eolian silt, eolian sand, and cultural remains, and (2) to determine the ages of these deposits. To understand these

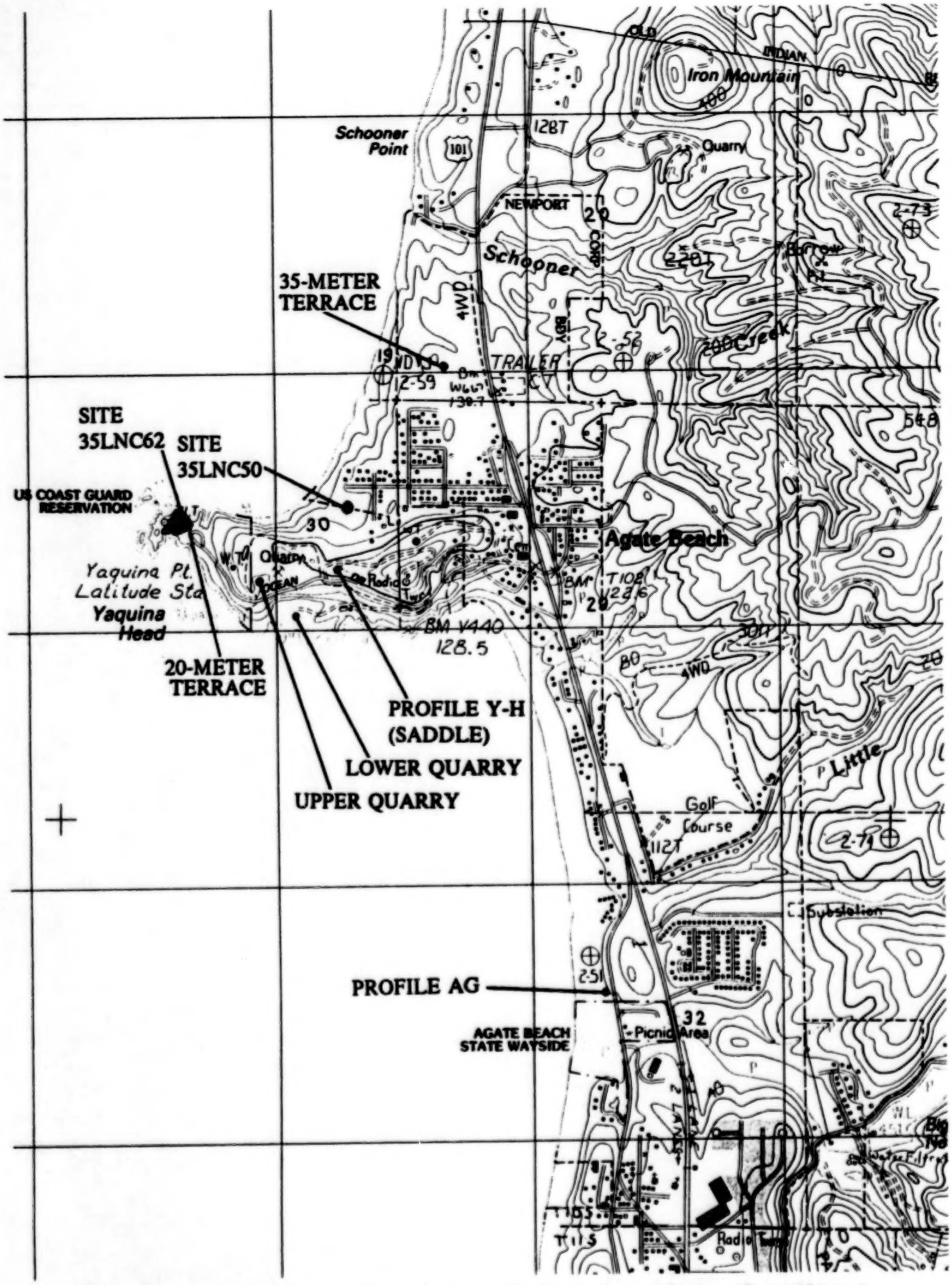

Figure 2-1. Yaquina Head vicinity showing locations of sediment samples.

relationships, older marine terrace sequences were examined elsewhere on Yaquina Head. Soil chemical analysis was used to differentiate between culturally-influenced and non-cultural layers.

GEOMORPHIC SETTING

Yaquina Head is one of the most substantial promontories on the central Oregon coastline. From Otter Rock to Seal Rock, a distance of about 25 km, the coastline is generally straight and has a sandy beach backed by a sea cliff cut into Quaternary marine terraces. Yaquina Head interrupts this straight coastline, projecting about 1.5 km seaward (Figure 2-1). The headland is formed by an intrusive mass of the Cape Foulweather basalt (Schlicker and others 1973). This intrusive mass is surrounded by the weaker Nye Mudstone, into which the adjacent marine terrace has been cut. Erosion has exposed the harder basalt as a prominent headland.

A very steep sea cliff, exposing the basalt, surrounds the headland. At the foot of the cliff is a presumably steep, rocky intertidal zone. A small beach lies in an indentation on the south side of the headland, near its western end. The beach is very steep and consists of coarse cobble-sized sediment underlain by bedrock, which is exposed in the intertidal zone. There may be small beaches on other sides of Yaquina Head, but they were not directly observable from the top of the headland.

Archaeological site 35LNC62 is located near the western tip of the headland, on a fairly level surface standing about 20-25 m (70-80 feet) above sea level (a.s.l.). This surface is a late Quaternary marine terrace, referred to in this report as the 20-meter terrace. The stratigraphy of the terrace consists of an abrasion platform cut into the basalt, overlain by several meters of unconsolidated, flat-lying sandy marine terrace deposits. More recent eolian sands form indistinct dune mounds, up to about two to three meters high, on top of the marine terrace deposits.

Moving eastward from 35LNC62, the land surface rises toward a basalt hill that forms the central part of the headland. The hill has two rounded peaks with a saddle between them. The higher eastern peak rises to slightly over 120 m (360 feet) a.s.l. The western peak rises to slightly over 80 m (240 feet) a.s.l. and has been cut by a large rock quarry on its south side. The quarry reveals basalt with a deeply incised upper surface, mantled by unconsolidated to weakly consolidated Quaternary sediments. These sediments have infilled and partially mantled the relief of the basalt surface. Sedimentary cover appears to thin upslope toward the peaks of the hills.

The hill of Yaquina Head is surrounded on the north, south, and east by a second marine terrace that stands at about 35 meters (120 feet) a.s.l. This terrace was tentatively identified as the Whiskey

Run terrace (age about 80,000 years BP) by McDowell (1989). Because of the difference in elevation, the 20-meter terrace is considered a separate, younger terrace from the 35-meter terrace, but it is possible that they are offset or warped segments of the same terrace. Eastward from the eastern peak, the 35-meter terrace is represented by a narrow strip of land at about 43 m a.s.l. (130 feet), on which Oregon Highway 101 is located. East of the highway the elevation rises again to higher, older marine terraces.

Site 35LNC62, on the tip of Yaquina Head, today occupies a physiographic situation that would offer some distinct locational advantages and disadvantages to prehistoric people. Advantages include visibility out to sea and north and south along the coastline, proximity to a rocky intertidal zone that may have provided shellfish and other marine resources, as well as scenic beauty. Apparent disadvantages include exposure to wind and difficult access down the sheer sea cliff to the intertidal zone. The present physiography of Yaquina Head may have developed only during the middle to late Holocene, as a result of sea level rise and wave erosion.

OLDER QUATERNARY DEPOSITS ON YAQUINA HEAD

Observations of the Quaternary sedimentary cover were made where available exposures were accessible. These places include the upper quarry, the lower quarry, the western quarry, and the upper part of the northern sea cliff adjacent to the archaeological site (Figure 2-1). The marine terrace deposits were examined during investigations at archaeological site 35LNC50 on the north side of the headland (McDowell 1989). Stratigraphy observed at several key places is summarized in Table 2-1.

Unit B consists of marine terrace deposits and eolian deposits that date from a previous interglacial period when eustatic sea level was approximately at its present position. Since this interglacial, these deposits have been uplifted by tectonic processes. The marine facies of Unit B in the lower quarry is at a similar elevation to, and may be correlative with, the marine terraces immediately north and south of Yaquina Head. This terrace surface is tentatively identified as the Whiskey Run terrace, dating from approximately 80,000 years ago (McDowell 1989).

The stratigraphic relationship of Units B and C indicates that the western peak of Yaquina Head was a headland when the sea was at this terrace level. The eolian sand facies of Unit B was deposited against the sides of the headland at about this time. The eolian sand stabilized and was subsequently covered with colluvium, and possibly eolian silt deposits, in which the Neskowin and Salander soils formed.

Unit C includes colluvial and possibly eolian deposits that overlie Unit B. At several exposures, erosional basal contacts, stone

Table 2-1. Summary of older stratigraphic units on Yaquina Head above the 20-m terrace and 35LNC62.

Stratigraphic Unit	Description
C	Loam, clay loam or silt loam deposits, black, brown, or reddish brown in color and 0-2m thick. Unit C is the uppermost deposit on the upper part of Yaquina Head (above the 20 m terrace). Modern surface soils on Unit C are mapped as Neskowin silt loam or Neskowin-Salander soil association (Soil Conservation Service n.d.). Unit C fills low spots and thins toward high spots on the surface of Unit B. Unit C is probably partly eolian in origin, although at some exposures Unit C consists clearly of colluvial deposits. Unit C may also include some basalt residuum. Unit C contains several layers separated by two or more dipping stone lines that indicate colluvial deposition and erosion from the upper slopes of the western peak. A paleosol is evident beneath one of the stone lines. Unit C contains angular basalt boulders in some exposures in the lower quarry, indicating mudflow deposition. At other exposures, Unit C is relatively stone-free. In some places the undulating contact between Unit C and Unit B is clearly an erosional unconformity created by colluvial and fluvial erosion of Unit B. A U-shaped gully cut into Unit B about 30 to 40 m wide and about 3 to 4 m deep, filled with Unit C, is exposed in the lower quarry.
B	Well-sorted, bedded sand that underlies Unit C and fills deep hollows on underlying basalt bedrock. Thickness is over 5 m in places. Sand is light yellow, well-sorted, fine sand. Unit B1 is steeply cross-bedded, indicating an eolian origin. Unit B1 is well-exposed in the upper quarry. Unit B2, exposed in the lower quarry, has apparently flat to low-angle bedding and is possibly beach and nearshore deposits. The boundary of Unit B with Unit A is erosional, and basalt cobbles are present in the lower part of Unit B, indicating beach deposition during a rising sea level.
A	Basalt with wave-cut upper surface.

lines, and gully fills indicate that Unit C is in part colluvial in origin. The erosion and mass movements represented by colluvial facies of Unit C may have occurred during the glacial period following abandonment of the Unit B sea level, during the present interglacial, or even during the recent historical past.

Evidence for a partly eolian origin of Unit C is less clear. A layer of eolian ashy silt was recognized at 35LNC50, on the basis of soil and sedimentary characteristics (McDowell 1989). This eolian silty deposit has been recognized in recent soil mapping work by the U.S. Department of Agriculture Soil Conservation Service (J. Shipman, personal communication, 1988). It occurs as a layer up to one meter or more thick, on higher marine terraces (the 35-meter terrace and higher) in a zone immediately along the coastline. It develops andic soil properties--low bulk density, high organic matter content, dark color, and presumably a high phosphorous content. These characteristics of Unit C are evident in Profile YH exposed in an auger hole located on the saddle between the two hills of Yaquina Head (Table 2-2). Profile YH is dominated by Stratigraphic Unit C, but it has some colluvial material derived from the underlying basalt mixed in with it.

GENERAL STRATIGRAPHY ON THE 20-METER TERRACE

Three stratigraphic units are recognized on the marine terrace where 35LNC62 is located (Table 2-3). Sedimentary data on the stratigraphic units are summarized in Table 2-4 and illustrated in Figure 2-2.

Unit D is a sandy marine terrace deposit that overlies the basalt of the headland. The upper part of Unit D correlates with archaeological Stratum 4, a culturally sterile layer that underlies the archaeological deposits. No radiocarbon dates were obtained from Unit D. The position of Unit D high above the present high interglacial sea level indicates that it has undergone substantial tectonic uplift since deposition. Unit D probably dates from the last interglacial, 80,000 to 125,000 years ago.

Unit E is a thin layer that is higher in silt and clay than the overlying Unit F and the underlying Unit D. Unit E generally correlates with archaeological Stratum 3, but in some cases archaeological Stratum 3 consists of Unit D deposits. Unit E may be a young, thin layer of the silty eolian deposits recognized at archaeological site 35LNC50 and in Unit C in this report. Six uncorrected radiocarbon dates from Unit E indicate that it was deposited between 6300 and 4000 BP. The oldest date, 6350 ± 140 RCYBP (Beta-37501), was obtained on a small sample, and therefore it may be somewhat inaccurate. The next

Table 2-2. Description of Profile YH exposed in an auger hole in the saddle between the two hills of Yaquina Head.

Depth	Description
0-40 cm	Very dark brown silt loam; strong, medium and fine granular structure, grading to subangular blocky with depth; few small angular reddish rock fragments at 30-40 cm; strongly acid (pH 5.5); sample LNC62-6-1 at 15-22 cm, and sample 35LNC62-6-2 at 25-32 cm.
40-55 cm	Medium brown silt loam; few rock fragments as above; medium acid (pH 5.6); sample 35LNC62-6-3 at 40-45 cm.
55-90 cm	Medium brown silt loam with common weathered rock fragments; rock fragments look like weathered basalt rather than cemented orange sand; sample 35LNC62-6-4 at 55-65 cm.
90-115 cm	Medium brown silt loam with many weathered rock fragments; medium acid (pH 5.9); sample 35LNC62-6-5 at 90-95 cm.
115-125 cm	Brown silty clay loam with few rock fragments; medium acid (pH 5.6); sample 35LNC62-6-6 at 115-120 cm.
125-150 cm	Orange-brown sandy loam with rock fragments, grading into yellow loamy sand with depth; sample 35LNC62-6-7 at 130-138 cm.
150-205 cm	Yellow-orange loamy sand with few rock fragments; samples LNC62-6-8 at 170-179 cm and 35LNC62-6-9 at 200-205 cm.

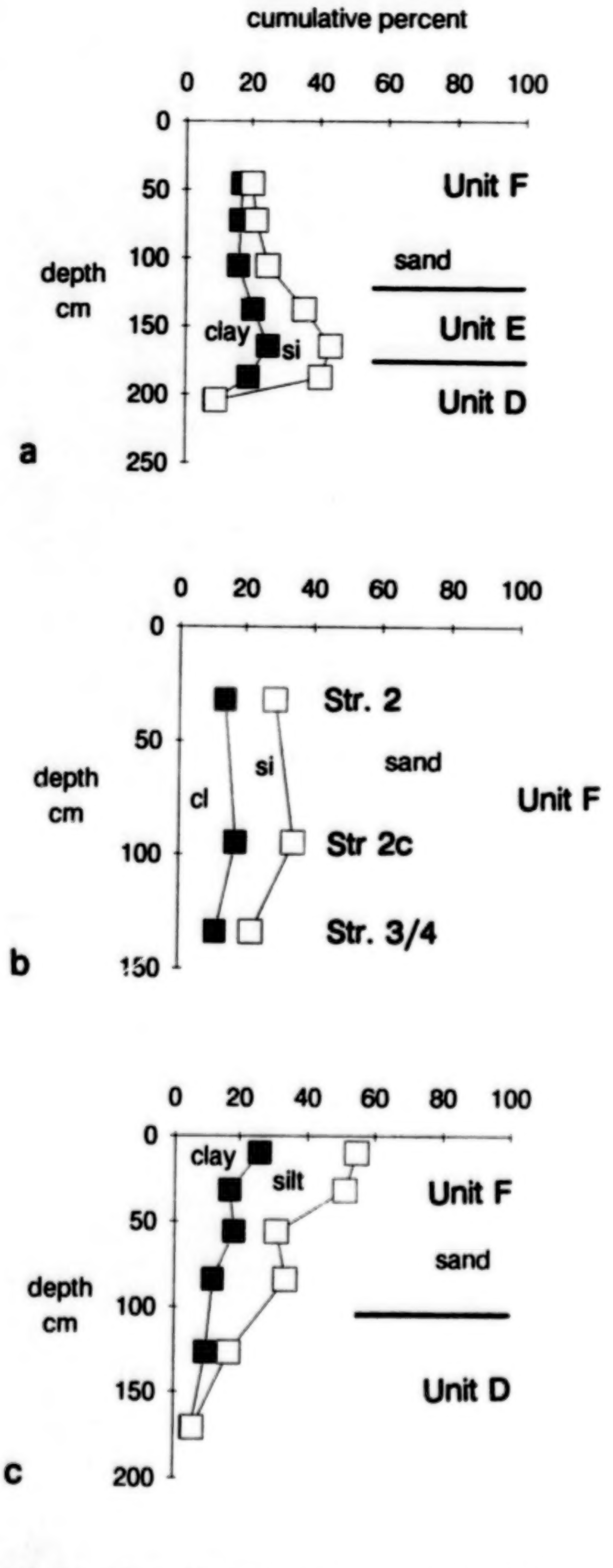

Figure 2-2. Particle size distribution for Profiles 35 (a), 7/8 (b), and AG (c).

Table 2-3. Summary of stratigraphic units associated with the 20-meter terrace and 35LNC62.

Stratigraphic Unit	Description
F	Dark brown to yellow-tan fine sandy loam overlying Unit E. Unit F is eolian in origin. At archaeological excavation Unit 1/2, Unit E contains two thin buried A horizons, indicating episodic deposition. Unit F forms several indistinct knolls that rise 1.5 to 2 meters above the flat surface of the 20-meter terrace and are interpeted as dunes. Cultural deposits are interstratified in Unit F, and also occur in the upper part of Unit E. Lower contact with Unit E is gradual and indicates mixing of Unit F into the upper part of Unit E.
E	Brown to black silt loam to silty clay loam, with soil development, overlying Unit D. Thickness is about 1 meter where observed in upper part of sea cliff on north edge of 35LNC62 and in archaeological excavations Unit 1/2, and about 0.5 m at Profile 35. It is absent at Profile AG, where Unit F directly overlies a sandy deposit that is either Unit D or B. Cultural deposits occur within the upper part of Unit E. Lower contact with Unit D commonly consists of a zone of angular chunks of cemented upper part of Unit D supported by a matrix of Unit E material. This lower contact may be erosional, or it may be due to bioturbation during and after deposition of Unit E. Unit E may be eolian in origin.
D	Well-sorted, generally unbedded sand. Thickness is commonly several meters and may be greater in places. Upper part of Unit D is orange and cemented by pedogenic processes, but it becomes lighter and less cemented with depth. Unit D presumably overlies wave-cut surface of Unit A, but contact was not directly observed. Unit D is probably beach and nearshore deposits.
A	Basalt with wave-cut upper surface.

oldest date, 5330 ± 110 RCYBP (Beta-37500), was obtained on wood from a layer of clayey sand that appears to correlate with the lower part of Unit E, or a mixture of material from Units E and D. This date therefore probably provides a better estimate for the beginning of deposition of Unit E.

Unit F is a recent eolian sand that overlies Unit E and forms the modern land surface where not disturbed by historical fill. Unit F is contemporaneous with, and perhaps partly post-dates, prehistoric human occupation at 35LNC62. Archaeological strata 1 and 2 are part of Unit F. Four uncorrected radiocarbon dates indicate that deposition of Unit F was active between 3700 and 2700 BP. Deposition of Unit F probably continued after 2700 BP. Relationships between the stratigraphic units and cultural deposits are discussed further in Chapter 3.

The stratigraphy of the 20-meter terrace was also examined at a non-archaeological locality. Profile AG was described on top of a sea cliff on the north side of Agate Beach State Wayside, about 1.5 km south of Yaquina Head (Table 2-5). This profile is situated at about 13 m (40 feet) a.s.l. In this profile, Unit F is 102 cm thick and directly overlies Unit D. There is no direct evidence of Unit E material, but it may be present in small amounts mixed into the lower part of Unit F and the upper part of Unit D.

POSSIBLE SAND DUNE RAMP TO BEACH

Archaeological remains at 35LNC62 prove that the occupants had access to the intertidal zone. The present-day sheer sea cliffs make beach access extremely difficult. The sea cliff morphology around Yaquina Head may have been different during at least part of the Holocene (McDowell 1987a). Thin eolian sand deposits (Unit F) roughly contemporaneous with occupation of 35LNC62 occur on top of the sea cliff, and thick older deposits occur in the quarry and saddle areas. Because sand is transported by wind in saltation rather than suspension, it is difficult to see how sand could have been carried up to the top of the

Table 2-4. Sediment data from profiles for archaeological excavation units 35 and 7/8, and non-archaeological profile AG.

Sample No.	Depth (cm)	Strat. Unit	Arch. Stratum	% sand	% silt	% clay	% LOI*
Unit 35 Profile:**							
35LNC62-3-4	36-57	F	1	79.8	3.0	17.2	5.5
35LNC62-3-5	57-90	F	1	78.7	4.6	16.7	6.7
35LNC62-3-6	90-122	F	1	75.2	8.8	16.0	7.5
35LNC62-3-7	122-155	E	3	64.5	15.0	20.5	10.0
35LNC62-3-8	155-176	E	3	56.6	18.4	25.0	7.9
35LNC62-3-9	176-200	E	3	59.7	21.0	19.3	9.1
35LNC62-3-10	200-210	D	4	90.5	0.7	8.8	2.5
Unit 7/8 Profile:**							
35LNC62-CD-2	30-35	F	1	71.3	14.7	14.0	9.0
35LNC62-CD-2C	90-100	F	2	65.8	16.7	17.5	7.4
35LNC62-CD-3/4	130-137.5	D/E	3	77.8	10.7	11.5	6.8
Profile AG:***							
35LNC62-AG-1	0-20	F	NC	45.2	28.8	26.0	14.3
35LNC62-AG-2	20-45	F	NC	48.7	34.1	17.2	10.0
35LNC62-AG-3	45-67	F	NC	68.9	12.6	18.5	11.6
35LNC62-AG-4	67-102	F	NC	66.3	21.7	12.0	9.1
35LNC62-AG-5	102-152	D	NC	82.8	7.3	9.9	3.2
35LNC62-AG-6	152-190	D	NC	94.0	0.5	5.5	1.3

* %LOI - % loss on ignition
** Cultural profiles described in Chapter 3
*** Non-cultural profile described in Table 2-6
NC Non-cultural profile

Table 2-5. Description of profile AG on top of sea cliff on north side of Agate Beach State Wayside.

Horizon	Depth	Description
A1	0-20 cm	Dark brown loam; weak, medium crumb structure; friable; common roots; few coarse charcoal fragments; strongly acid (pH 5.1); abrupt, smooth lower boundary; sample 35LNC62-AG-1.
A2	20-45 cm	Dark brown loam; moderate, medium and coarse granular structure; friable; common roots; few coarse charcoal fragments; strongly acid (pH 5.1); abrupt, wavy lower boundary; sample 35LNC62-AG-2.
Bw1	45-67 cm	Yellowish-brown sandy loam; strong, medium to very fine subangular blocky structure; slightly hard; common fine roots; common orange cutans on ped faces; few red lenses described below; very strongly acid (pH 5.0); indistinct, gradual lower boundary; sample 35LNC62-AG-3.
		Strong red lenses with very coarse charcoal chunks; red lenses are 2-4 cm thick, 10-30 cm long, subhorizontal, wavy, irregular, slightly firm; lenses look like burned inclusions rather than depositional lenses; very strongly acid (pH 4.6); sample 35LNC62-AG-7.
Bw2	67-102 cm	Yellowish-brown sandy loam; strong, medium to very fine subangular blocky structure, decreasing to moderate at base; slightly hard; few medium roots; common orange cutans on ped faces, as above; strongly acid (pH 5.1); distinct, gradual, large-scale wavy lower boundary; sample 35LNC62-AG-4.
2Bsm	102-152 cm	Yellowish-orange cemented very fine loamy sand; strong, coarse and medium angular blocky structure; hard, brittle, weakly cemented; orange cutans on ped surfaces; ped interiors are pale yellow to whitish; very few coarse roots; boundary between Bw2 and 2Bsm horizons consists of angular chunks of 2Bsm material in a matrix of Bw2 material; very strongly acid (pH 5.0); gradual, smooth lower boundary; sample 35LNC62-AG-5.
A2Cm	152-190 cm	Yellowish cemented very fine sandy loam; hard, brittle; weakly cemented, but more strongly than above; structureless, but cut by planar cracks and fractures; some orange mottles and stains on crack faces; very few coarse roots; strongly acid (pH 5.5); base of exposure is at 190 cm; sample 35LNC62-AG-6.

headland unless a sloping surface was present. It is possible that a sloping ramp lay against part of the headland sea cliff and allowed transport of sand to the top of the headland. This ramp would have allowed easier access to the beach.

Such a ramp, if it existed, may have consisted of a climbing sand dune. In desert areas, steep climbing sand dunes are built against the windward sides of mountain ranges and, if sand is carried over the crest, a steeper falling dune forms on the lee side (Greeley and Iversen 1985). Exposures in the upper quarry and elsewhere along the Oregon coast (for example at the Cape Perpetua Visitors Center) reveal eolian sand deposits plastered against steep bedrock slopes that appear similar to desert climbing dunes. The existing climbing dune deposits on the Oregon coast are presently inactive and vegetated, and they commonly are truncated at their base and detached from the modern beach by wave erosion. In addition, inactive eolian sand dunes perched on top of sea cliffs and detached from their sand source are present at many places on the Oregon coast, including the marine terraces north and south of Yaquina Head.

The time at which these perched and truncated dune deposits formed and the time at which they were eroded is not known. Several lines of evidence indicate that they developed during or since the last glacial sea level minimum at about 18,000 BP. They occur on top of the lowest, presumably last, interglacial marine terraces. They have only moderate soil development, are not buried by other deposits, and have relatively fresh morphology. These dune deposits probably were truncated by wave erosion due to rising relative sea level during the middle or late Holocene (last 6000 years). At an exposed promontory like Yaquina Head, erosion may have been sufficient to remove completely the climbing sand dune deposits. The relative sea level rise may have been caused by glacio-eustatic sea level rise, or by tectonic subsidence of the coastline.

SOIL CHEMISTRY

Thirty-eight soil samples in two batches were chemically analyzed to address questions concerning anthropic enrichment of particular soil layers and boundaries between stratigraphic units. In the first batch, 10 samples representing deep, charcoal-bearing layers were analyzed to determine whether these layers were human-caused or not. These samples were fused with lithium borate and then dissolved in a perchloric-nitric-hydrofluoric acid mixture to totally dissolve the minerals. Results are reported as weight percentages of oxides of major elements (Table 2-6).

In the second batch, 31 samples were dissolved in a perchloric-nitric-hydrofluoric acid mixture to dissolve the minerals, although solution of the most resistant minerals may not have been as complete as in the first procedure. Results are reported in weight percentages of major elements (Table 2-7). The second batch included replicates of three samples that had been analyzed in the first batch, to insure comparability of results. All analyses were done by Chemex Labs, Inc. of Sparks, Nevada, by ion-coupled plasma atomic emission spectrophotometry.

Non-Archaeological Control Samples

Profile AG from the top of the sea cliff at Agate Beach State Wayside represents a profile that is not influenced by human enrichment but is stratigraphically similar to the area of 35LNC62 (Figure 2-3a). Phosphorus (P) is the most useful marker of human enrichment of a soil. Previous studies (McDowell 1988, 1989) indicate that a P content of 1000 ppm or greater is typical of human-enriched soils. All the Profile AG samples are below this threshold value. The lithologic

Table 2-6. Chemical data for soil samples analyzed by fusion and perchloric-nitric-hydrofluoric digestion (batch 1).

Sample No.	Depth (cm)	Strat. Unit	Arch. Stratum	Weight Percentages								
				Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO
Dark Soil Layer												
35LNC62-P1-10	147-185	E	3	14.65	10.52	1.35	1.78	1.46	1.29	3.83	0.33	0.23
35LNC62-P2-7	149	F	2/3	14.79	12.70	3.13	1.18	0.84	0.75	3.50	0.45	0.24
35LNC62-P2-8	189	?	3?	13.38	11.56	1.83	2.55	1.31	1.15	5.07	0.31	0.37
Burned Zone												
35LNC62-P1-14	256-276	E	3	18.77	7.83	0.74	0.63	1.28	1.41	1.72	0.26	0.03
35LNC62-P1-13	253	E	3	15.92	6.36	0.93	1.47	1.80	1.48	2.72	0.25	0.07
35LNC62-P2-9	211-232	?	?	14.76	5.95	0.89	1.26	1.50	1.49	2.73	0.28	0.09
35LNC62-A2-20	190-200	?	3	15.23	8.06	1.05	1.64	1.42	1.10	2.21	0.46	0.12
35LNC62-A8-20	190-200	D	3	15.60	5.84	0.89	1.14	1.23	1.04	2.23	0.44	0.06
35LNC62-F1-16	150-160	D	3	15.34	8.00	1.08	1.76	1.49	1.16	2.16	0.46	0.10
35LNC62-H3-26	250-260	?	3	15.92	7.86	0.92	1.21	1.31	1.21	1.94	0.31	0.10

P1 Samples: Excavation Unit 1/2

A2 Sample: Auger Hole A2

F1 Sample: Auger Hole F1

P2 Sample: Excavation Unit 3/4

A8 Sample: Auger Hole A8

H3 Sample: Auger Hole H3

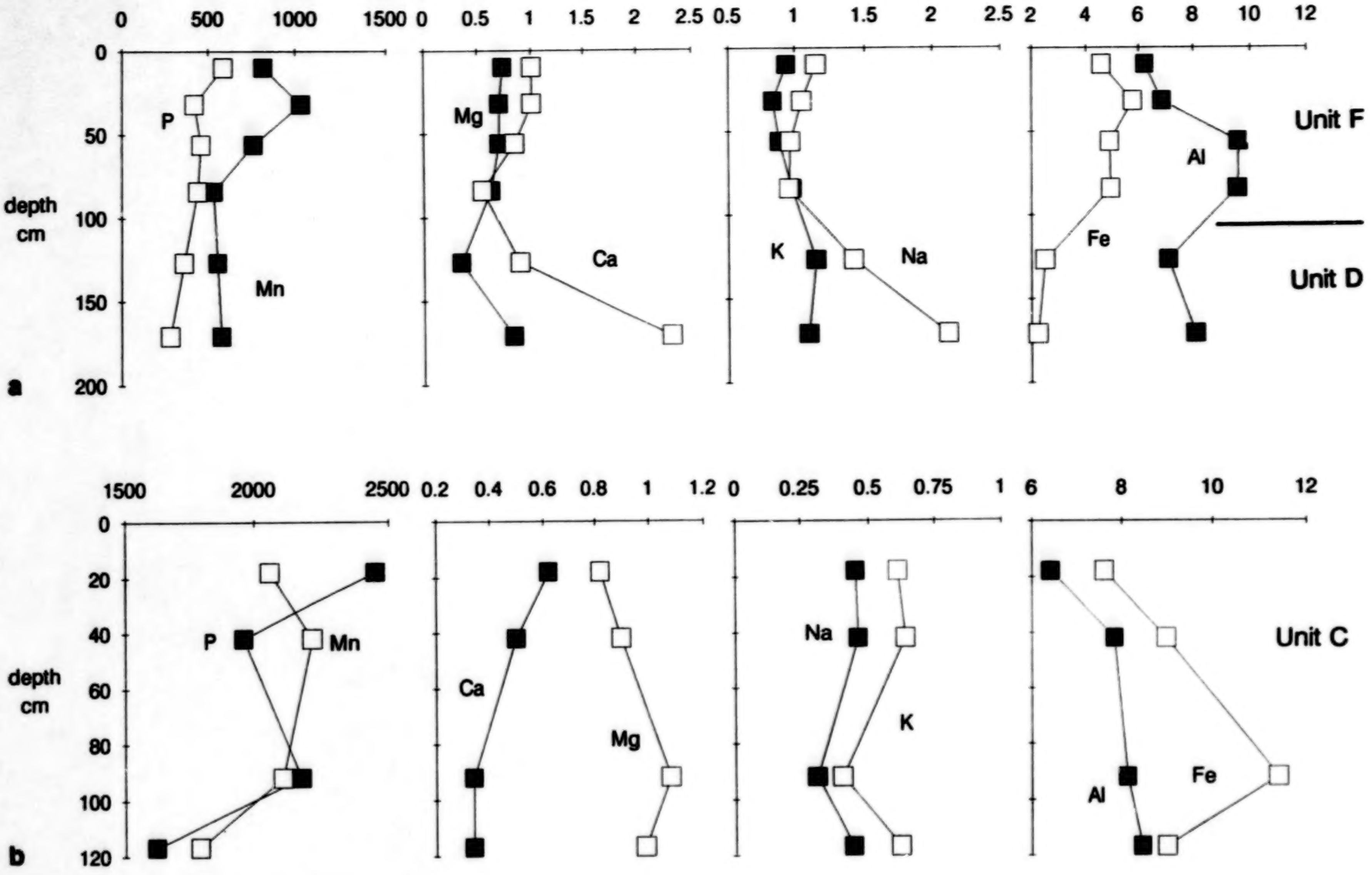

Figure 2-3. Chemical data from Profile AG (a) and Profile YH (b).

Table 2-7. Chemical data for soil samples analyzed by perchloric-nitric-hydrofluoric digestion (batch 2).

Sample No.	Depth (cm)	Strat. Unit	Arch. Stratum	Al%	Ca%	Fe%	K%	Mg%	Mn,ppm	Na%	P,ppm	Ti%
Profile AG												
35LNC62-AG-1	0-20	F	NC	6.24	1.01	4.58	0.94	0.74	820	1.15	590	1.32
35LNC62-AG-2	20-45	F	NC	6.87	1.01	5.77	0.84	0.71	1035	1.05	420	1.51
35LNC62-AG-3	45-67	F	NC	9.59	0.85	4.89	0.89	0.71	765	0.97	460	1.07
35LNC62-AG-4	67-102	F	NC	9.55	0.55	4.94	0.98	0.63	535	0.96	440	1.09
35LNC62-AG-5	102-152	D	NC	7.11	0.90	2.49	1.15	0.35	560	1.42	360	0.96
35LNC62-AG-6	152-190	D	NC	8.09	2.32	2.23	1.10	0.84	580	2.12	280	0.53
Profile 6												
35LNC62-6-1	15-22	C	NC	6.40	0.62	7.61	0.61	0.82	2060	0.45	2450	1.48
35LNC62-6-3	40-45	C	NC	7.84	0.50	9.01	0.64	0.90	2220	0.46	1960	1.73
35LNC62-6-5	90-95	C	NC	8.13	0.34	11.4	0.40	1.08	2110	0.31	2180	2.39
35LNC62-6-6	115-120	C	NC	8.48	0.34	9.04	0.62	0.99	1790	0.44	1620	1.78
Unit 35 Profile												
35LNC62-3-4	36-57	F	1	7.99	1.63	4.07	1.23	0.67	840	1.66	2090	0.93
35LNC62-3-5	57-90	F	1	8.26	1.54	4.13	1.15	0.64	830	1.61	2310	0.88
35LNC62-3-6	90-122	F	1	8.08	1.66	4.02	1.11	0.71	865	1.62	2610	0.84
35LNC62-3-7	122-155	E	3	7.07	1.65	4.79	0.98	0.70	1120	1.33	3320	1.18
35LNC62-3-8	155-176	E	3	7.66	1.45	4.88	1.02	0.59	830	1.39	1370	1.13
35LNC62-3-10	176-200	E	3	9.69	1.07	4.55	0.80	0.52	415	1.11	2130	0.67
35LNC62-3-10	200-210	D	4	10.00	1.90	2.82	1.26	0.67	650	2.18	960	0.52
Unit 7/8 Profile												
35LNC62-CD-2	30-35	F	1	7.17	1.98	4.91	0.78	0.79	885	1.06	3570	1.03
35LNC62-CD-2C	90-100	F	2	7.33	2.44	4.81	1.05	0.61	1000	1.54	1420	1.17
35LNC62-CD-3/4	130-137	D/E	3/4	9.55	1.98	2.87	1.23	0.40	325	1.96	830	0.42
Area A												
35LNC62-R-1	110-120	F	1	7.50	2.26	4.83	0.84	0.62	1055	1.15	2900	1.08
35LNC62-N-1	110-120	F	2	7.65	2.64	4.56	1.05	0.61	850	1.46	1930	0.98
Dark Soil Layer												
35LNC62-P2-7	130-168	E	2/3?	7.56	0.88	7.46	0.66	1.20	1480	0.88	1510	1.77
35LNC62-P2-8	168-211	E	3?	6.97	1.18	5.66	0.84	0.75	1430	1.11	1140	2.05
35LNC62-A3-1	130-140	E	3	8.07	1.15	4.71	0.81	0.55	720	1.21	1310	0.96
35LNC62-H5-1	190-200	E	3	7.72	1.10	4.93	0.89	0.64	935	1.24	1790	1.07
35LNC62-B-1	120-130	E	3	7.81	1.24	4.57	0.81	0.55	795	1.20	2850	0.80
Burned Zone												
35LNC62-P1-13	251-256	E	3	8.42	0.95	3.37	1.05	0.48	530	1.56	720	1.17
35LNC62-SH-1		C	NC	9.90	0.50	7.02	0.62	0.32	855	0.93	1310	1.36
35LNC62-5-3		C	NC	10.30	0.24	10.6	0.48	0.43	645	0.46	1120	1.87
35LNC62-AG-7	67	E/F	NC	7.34	0.91	5.29	0.84	0.62	1000	1.12	360	1.68

P1 Sample: Excavation Unit 1/2
H5 Sample: Auger Hole H5
R Sample: Excavation Unit 19
AG Sample: Agate Beach
P2 Samples: Excavation Unit 3/4
B Sample: Excavation Unit 6
SH Sample: Strawberry Hill
NC = Non-cultural
A3 Sample: Auger Hole A3
N Sample: Excavation Unit 19
5-3 Sample: Lower Quarry

discontinuity in Profile AG is shown by increases in calcium (Ca), magnesium (Mg), and sodium (Na), and decreases in iron (Fe) and aluminum (Al) in the two lowest samples.

Profile YH from the auger hole in the saddle between the two hills on Yaquina Head represents a profile presumably without human influence but located on the older deposits of Unit C (Figure 2-3b). These deposits are geochemically distinct from the younger deposits of the 20-meter terrace in two ways. First, the older deposits are more weathered, as reflected by their titanium (Ti) content. Ti occurs in resistant minerals, and it tends to become concentrated in soil as more mobile elements are depleted by leaching. In a typical soil formed in a single parent material, Ti content can be expected to decrease from the surface downward. The profile from the saddle has the highest Ti content of any of the profiles analyzed.

Second, the profile from the saddle is anomalously high in P for a profile that is not human-influenced. This high P content may be due to the andic character of the eolian silty deposits in Unit C. Andic soils retain high amounts of phosphorus naturally. Alternatively (but less likely), there may be a previously unknown archaeological site in the saddle between the two hills of Yaquina Head.

Archaeological Profiles

The profile from the west wall of archaeological excavation Unit 35 in Area A represents a human-influenced profile within 35LNC62 but outside the main shell midden deposit (Figure 2-4a). P content is significantly higher than at Profile AG, and is highest at the "living surface" in Stratum 3 at 122-155 cm depth. P content drops below 1000 ppm, generally considered the threshold for human-influenced soils, in archaeological Stratum 4 (Unit D), confirming that this is essentially a sterile stratum. Ca content at the Unit 35 profile is somewhat higher than at comparable levels of Profile AG, probably reflecting the presence of shell nearby. Na, probably introduced by sea spray, is higher at the Unit 35 profile than at Profile AG. Mg, Mn, K, Fe and Al contents at the Unit 35 profile and the AG profile are similar.

The profile from archaeological excavation Unit 7/8 represents a human-influenced profile including the shell midden in Area B (Figure 2-4b). P is high in Stratum 2, but drops below 1000 ppm in Stratum 3. Ca contents, among the highest of all the samples analyzed, reflect the high density of shell in this profile. Values for Mn, Mg, K, Na, Fe, and Al are similar to those for the Unit 35 and AG profiles.

Two additional samples are from the upper portions of the cultural deposit in Area A. A sample from archaeological Stratum 1 in Unit 19 (Sample LNC62-R-1) produced one of the highest P values reported. A sample from Stratum 2 in Unit 23 (LNC62-N-1) produced moderate P values comparable to those from the shell midden (Stratum 2c) in Unit 7/8 in Area B.

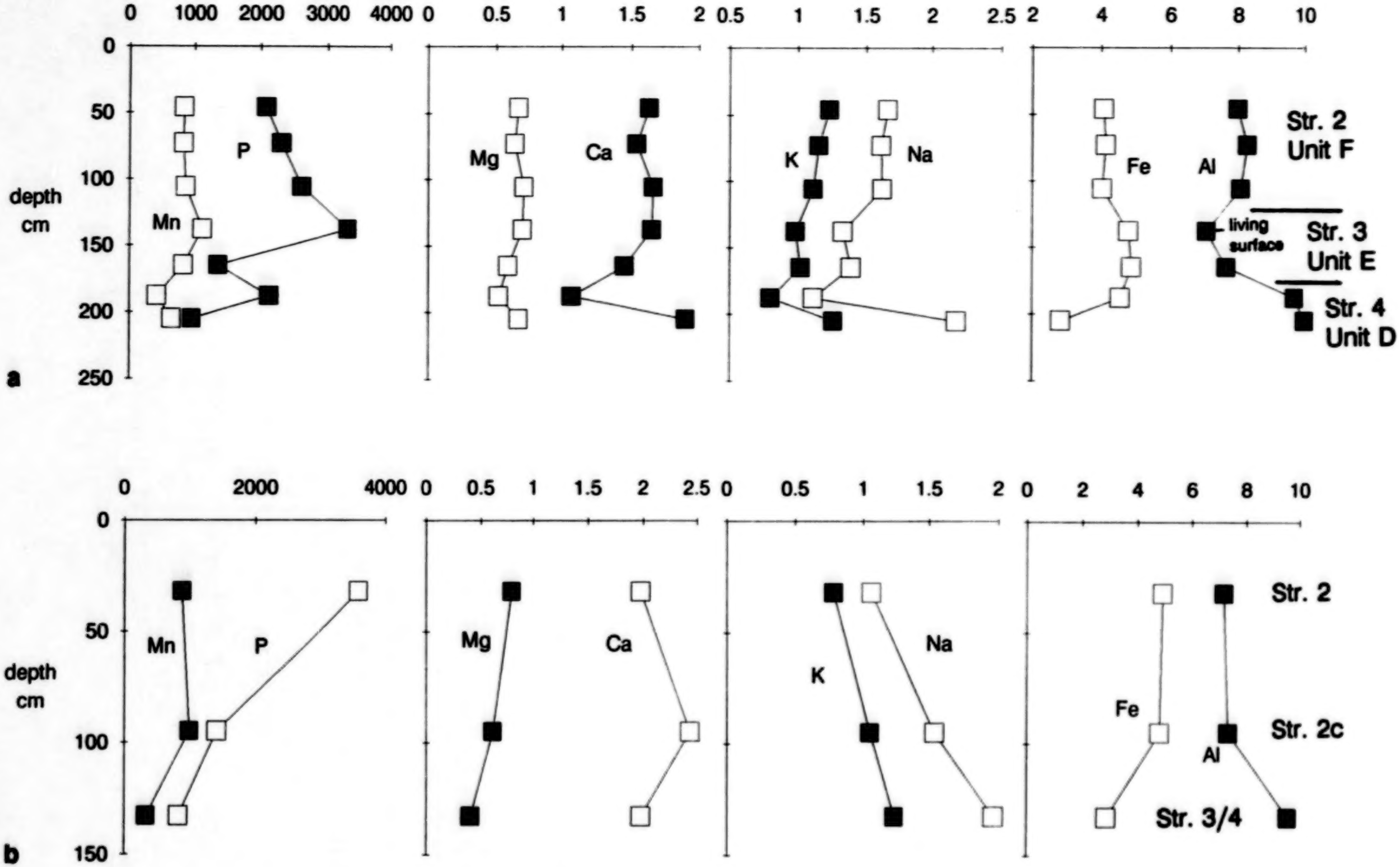

Figure 2-4. Chemical data from Profile 35 (a) and Profile 7/8 (b).

Dark Soil Layer Samples

During auger testing and initial excavations at the site, deeply buried dark-colored soil layers containing charcoal but free of artifacts were found to occur widely across the 20-meter terrace surface. These dark layers underlie Unit F, commonly occur in Unit E or the upper part of Unit D, and are stratigraphically equivalent to the surface on which the shell middens were deposited. Selected samples were chemically analyzed to determine whether these layers were human-influenced or were natural buried soil A horizons (Tables 2-6 and 2-7). All of the batch 2 samples had P content greater than 1000 ppm, indicating human enrichment.

Three of the samples analyzed in batch 1 also are from this buried dark layer. For batch 1 samples, a value of about 0.23% P_2O_5 is theoretically equivalent to a value of 1000 ppm P. However, values cannot be directly compared because relative percentages are affected by the greater dissolution rate for batch 1 samples. Comparison of batch 1 and batch 2 values for samples LNC62-P1-14, LNC62-P2-7, and LNC62-P2-8 indicates that a batch 1 value of 0.30% P_2O_5 is approximately equivalent to a batch 2 value of 1000 ppm P. On this basis, sample LNC62-P2-7 from batch 1 appears to be human influenced, but human enrichment of samples LNC62-P2-8 and LNC62-P1-10 from batch 1 is slight or absent.

One complication in the interpretation of P values from Stratigraphic Unit E is the possibility of high P values due to parent material that had developed andic properties. Profile YH, in older and higher andic material of Stratigraphic Unit C, does have high P values without cultural enrichment. Two samples (LNC62-P1-13, LNC62-P1-14) from Stratigraphic Unit E on the 20-meter terrace that are clearly non-cultural have P values of less than 1000 ppm. These data indicate that Unit E has not had time to develop the non-cultural P-enrichment of Unit C, and that on the 20-meter terrace P values of greater than 1000 ppm should be interpreted as culturally enriched.

Burned Zone Samples

Very deep soil layers with a bright red and black color, and containing abundant charcoal and in one case a burned log, were encountered in several auger holes and excavation units. Samples from these layers were tested to determine whether they resulted from natural fires or human occupation. Seven samples were tested in batch 1. Samples LNC62-P1-13, LNC62-P1-14, LNC62-P2-9, and LNC62-H3-28 do not have P values high enough to indicate human influence. On the other hand, Samples LNC62-A2-20, LNC62-A10-20, and LNC62-F1-16 do have relatively high P values, suggesting human influence.

In batch 2, three samples from red soil layers that were not human-influenced were tested. Sample LNC62-5-3 is from a bright red burned lens in Stratigraphic Unit C in the lower quarry area. It has a moderately high P content, but lower P values than Profile YH that were interpreted as probably non-archaeological. Sample LNC62-SH-1 is from a red burned lens with charcoal in Stratigraphic Unit C equivalent material at Strawberry Hill, about 40 km south of Yaquina Head. It also has a P content that is moderately high, but there is no direct evidence of human occupation. Sample LNC62-AG-7 is from a bright red lens in Stratigraphic Unit F or E equivalent material at Profile AG. It has a low P content.

SUMMARY

Yaquina Head has existed as a coastal headland during two or more interglacial periods, including the present one, and older marine terrace and eolian deposits are found above the level of 35LNC62. The 20-meter terrace on which 35LNC62 sits is mantled with marine terrace deposits of the previous interglacial as well as eolian deposits. Archaeological remains at 35LNC62 lie beneath and within Holocene eolian sand deposits. The prevalence of past eolian activity at Yaquina Head indicates that for at least part of its history the geomorphology of the headland may have been quite different from that of today.

The archaeological remains at 35LNC62 occur within two of the stratigraphic units recognized during the geomorphological research. Archaeological strata 1 and 2 (including 2c) occur within Stratigraphic Unit F. Four uncorrected radiocarbon dates obtained during the 1989 investigations indicate that this unit was active between 2700 and 3700 BP. Archaeological Stratum 3 generally correlates with Stratigraphic Unit E, but there are exceptions. This is because archaeological Stratum 3 was defined on the basis of its relation to the shell midden and by color. Stratigraphic Unit E, on the other hand, was defined primarily on the basis of texture, because it is a distinct parent material. It is likely that archaeological Stratum 3 sometimes occurs in the sandy material of Unit F, sometimes in the silty clay material of Unit E, and occasionally in the sandy material of Unit D. In addition, Unit E probably is absent in some places, and in other places it may be so thin that it is mixed with the material above or the material below. Six uncorrected radiocarbon dates from Unit E indicate that it was deposited between 4000 and 6300 BP.

Soil chemical data, particularly phosphorous content, are useful for discriminating between human-influenced and non-human-influenced soil layers on the 20-meter terrace. Most soil samples from the older Quaternary deposits have high P contents, apparently due to their mineralogical composition rather than to human influence. On the 20-meter terrace a dark soil layer (Stratum 3) occurs at the level of the base of the shell middens, but extends widely beyond the limits of the shell middens as well. Chemical data indicate that this surface was affected by human occupation. Deeper burned layers on the 20-meter terrace generally do not show human influence and probably resulted from natural fires before human occupation of 35LNC62.

CHAPTER 3

EXCAVATIONS, STRATIGRAPHY, AND DATING

by Rick Minor and Robert R. Musil

Archaeological investigations at 35LNC62 in 1989 were designed to meet two main objectives. First, as a means of mitigating impacts to the cultural deposits, excavations were conducted in specific areas to be directly affected by proposed developments related to the Yaquina Head Interpretive Center. These proposed developments include construction of a new fence, utilities trenches, drainage culverts, and expansion of the lighthouse visitors parking lot. Aside from investigations directly related to proposed construction impacts, an effort also was made to establish the extent and nature of the cultural deposits on the headland, in order to facilitate future management of the archaeological site.

EXCAVATION METHODS

Two excavation methods were employed during this project: (1) auger testing, which was used to determine the extent and depth of the cultural deposits, and (2) unit excavations, which were used primarily to mitigate impacts to cultural deposits identified within the construction areas. For the most part, auger testing was conducted first, with the resulting information then used in the placement of excavation units. The locations of both the auger holes and the unit excavations are shown on the topographic site map (Figure 3-1).

Auger holes were excavated with a heavy-duty soil auger with a 25 cm bore. The holes were dug in arbitrary 10 cm levels and the fill was screened through 3 mm (1/8-inch) mesh. A small sample of fill was collected from every other 10 cm level from each auger hole for potential analysis by the project geomorphologist. Unless blocked by rocks, all auger holes were excavated to the maximum reach of the auger (ca. 250 cm), or until sterile sediments underlying the cultural deposits were reached. The information gathered from the auger testing is summarized in the report appendix.

Unit excavations were carried out within 1 meter squares, but due to the considerable depth of the cultural deposits at least 1 x 2 meter blocks were employed to allow the excavations to reach the required depths. Within areas where cultural features were encountered, a number of 1 meter squares were placed contiguously to allow further

Table 3-1. Summary of cultural features recorded during 1989 investigations at 35LNC62.

Feature Number	Area	Unit	Depth Below Surface	Stratum	Description	Associations
1	B	7/8	40-50 cm	1	Butchering and cooking locus	FCR clusters, artifacts, faunal remains, top of shell
2	B	8	90-100 cm	2	Butchering and cooking locus	FCR cluster, artifacts, faunal remains
3	B	11/12	30-40 cm	1	Butchering and cooking locus	FCR scatter, artifacts, faunal remains, top of shell
4	A	42/43	55-95 cm	1	Secondary refuse deposit	FCR scatter, artifacts, faunal remains, top of shell
5	A	43	110-120 cm	2	Whale butchering locus	Whale bone cluster
6	A	38/39	80-125 cm	1	Secondary refuse deposit	FCR scatter, artifacts, faunal remains, top of shell
7	A	23	70-80 cm	2	Butchering locus	FCR cluster, artifacts, faunal remains
8	A	21/22	80-90 cm	1	Secondary refuse deposit	FCR scatter, artifacts, faunal remains, top of shell
9	A	22	90-110 cm	2	Firepit	FCR within pit
10	A	25	100-120 cm	3	Butchering and cooking locus	FCR cluster, artifacts, faunal remains; on living surface (Feature 15)
11	B	13	40-50 cm	1	Butchering and cooking locus	FCR scatter, artifacts, faunal remains, top of shell
12	B	13/14	50-70 cm	2	Firepit; bone/antler processing area	FCR in pit, artifacts, faunal remains; radiocarbon date of 3670 ± 70 RCYBP
13	A	19/20	90-100 cm	1	Secondary refuse deposit	FCR scatter, artifacts, faunal remains, top of shell
14	A	33	100-130 cm	2	Shell midden edge	Top of shell
15	A	25-41	100-150 cm	3	Living surface	Living surface, artifacts; radiocarbon dates of 3430 ± 70 RCYBP and 4100 ± 60 RCYBP
16	A	18	140-150 cm	3	Charcoal concentration	Burned Sitka spruce limb; radiocarbon date of 3990 ± 60 RCYBP
17	A	41	80-110 cm	2	Shell midden edge	Top of shell, faunal remains
18	A	41	140-150 cm	3	Artifact cluster	2 sandstone abraders, 1 hammerstone, and 3 unmodified cobbles on living surface (Feature 15)

exploration. Vertical control during the unit excavations was maintained through the use of line levels correlated to the site datum by the use of a transit and stadia.

Units were excavated in arbitrary 10 cm levels, subdivided according to cultural and natural stratigraphy. The fill was screened through 3 mm (1/8-inch) mesh and all cultural materials were bagged by the unit, level, stratum, and feature (if applicable) from which they were collected. At least one 10 x 10 cm column sample was taken from a wall in each excavation block for potential molluscan or sediment analysis. Artifacts uncovered in situ were recorded by their exact provenience on the excavation forms and, when appropriate, on feature forms.

The 18 cultural features encountered during the 1989 investigations were described and sketched in the field and further recorded by means of photographs. A number of hearth and faunal processing areas, consisting of fire-cracked rocks with associated artifacts and faunal remains, were documented within the shell and non-shell cultural deposits. Two other features consist of the topography of the edge of the shell deposit where the shell may have been cut or altered during site use. A summary of the cultural features recorded during the 1989 investigations is presented in Table 3-1. Detailed descriptions of the individual features are provided below under the description of fieldwork within each site area.

All of the excavation units were dug to well below the cultural deposits. In all, the unit excavations encompassed an area of 43 square meters, and a total volume of 67.3 cubic meters of fill was removed from the excavation units during the 1989 field season (Table 3-2). An additional 6.6 cubic meters was excavated during the 1989 auger testing program.

AUGER TESTING PROGRAM

The auger testing program was conducted in two phases. The first phase entailed definition of the cultural deposits within areas to be directly affected by proposed developments. In view of the linear nature of the proposed utility trenches, drainage culverts, and fence line construction, lines of auger holes spaced at five or 10 meter intervals were excavated along those corridors. The second phase of auger testing involved (1) excavation of additional auger holes to the east of the known archaeological site (Area C) to determine if cultural materials were present in that area; and (2) placement of auger holes around the periphery of the archaeological site to establish the horizontal extent of cultural deposits on the headland. Auger hole locations are shown in Figures 3-1, 3-2 and 3-16. In all, a total of 78 auger holes was excavated during the auger testing program.

Table 3-2. Summary of 1989 volume excavated by area and stratum.

	Volume (m^3)/Stratum				
Area	1	2	3	4	Total
A	28.13	3.76	9.56	1.20	42.65
B	9.03	3.30	2.40	0.15	14.88
C	5.20	--	4.20	0.40	9.80
Auger Holes	--	--	--	--	6.64
Total	42.36	7.06	16.16	1.75	73.97

Utility Trench A

Auger testing along the route of Utility Trench A (Auger Hole Line A) involved excavation of 11 holes. The results of these excavations indicated that the northern 20 meters of this line extended into the area where the lighthouse residence structures formerly stood. The upper 60-70 cm in A1 and A2 encountered road gravels, paint chips, metal, brick, wood, and glass. The upper 40-50 cm of the remaining auger holes along Line A consisted of a layer of sod overlying a thick layer of road gravel from the barn associated with the lighthouse residences. A deposit of dark sand underlies the road gravel in most areas, except near A6 where the top of the shell deposit comes in contact with the road gravel.

A small amount of shell was encountered in A3 at a depth of 110-130 cm, but the main shell deposit along this line extends from about three meters north of A5 to two meters south of A7. Underlying the shell in A4 and A8 was a dark cultural stratum; this cultural deposit occurs at the same level as does the shell midden in nearby excavation units. The soil underlying the shell midden becomes progessively lighter as culturally sterile sediments are reached. Over most of the area examined during the auger testing program the underlying sterile sediments consisted of compact orange or yellow sand.

As discussed in Chapter 2, chemical analysis was undertaken on sediment samples containing charcoal from A2 (190-200 cm), A3 (130-140 cm), and A8 (190-200 cm). All samples produced relatively high P (phosphorous) values, suggesting that the sediments in these levels had been influenced by human occupation. The high P values are consistent with the recovery of cultural materials from these auger holes, confirming that they are in fact within the site boundary.

The remaining three auger holes along this line (A9, A10, A11) did not contain evidence of prehistoric occupation. Although excavated to the underlying sterile sediments, the only cultural materials encountered were brick fragments from 20-50 cm below surface in A10.

Utility Trench B

Two auger holes were excavated along the proposed route of Utility Trench B. Both holes, dug to the full length of the auger, contained the same depositional sequence, consisting of a layer of road gravels underlain by brown sandy loam that was sterile of cultural materials. Orange sand, which underlies the cultural deposits on the headland, was encountered at the bottom of both auger holes. Shell was encountered in B2 from 20-50 cm below surface, but this material was broken into small bits with worn edges and probably represents a secondary deposit disturbed from its original context during parking lot construction. No firm evidence of prehistoric occupation was encountered along the route of Utility Trench B. The area tested by these auger holes thus appears to lie outside the boundary of the archaeological site.

Utility Trench C

Four auger holes were excavated along the route of Utility Trench C, a continuation to the east of Utility Trench B. The first two holes (C1, C2), dug to the full length of the auger, yielded similar depositional sequences: brown sandy loam, becoming darker and increasing in clay content with greater depth, underlain by grey clay. A noteworthy discovery in C1 was a burned zone indicated by a dense layer of charcoal at a depth of 220-240 cm. No cultural materials were recovered in association with this burned zone. Charcoal from this layer produced a radiocarbon assay of 5330 ± 110 RCYBP (Beta-37500). The presence of grey clay in this area is also noteworthy, as orange sand underlies the sandy loam deposits over most of the headland. The other two auger holes along this line were stopped by rocks at 160 cm (C3) and 40 cm (C4). No cultural materials were recovered from these four auger holes, and the route of Utility Trench C thus appears to lie outside the boundary of the archaeological site.

Drainage Culverts

Auger Hole Lines D and E were placed along the proposed routes of drainage culverts. Six holes were excavated along Line D. The first four holes (D1, D2, D3, D4) contained a similar depositional sequence with brown sandy loam underlain by orange sand or sandstone. In D2 the orange sand was underlain by grey clay. In the two westernmost auger holes along this line (D5, D6) only shallow deposits were present above the orange sand. Two auger holes along Line E (E1, E2) on the north edge of the dune in the middle of the parking lot likewise contained only shallow deposits above the orange sand. The shallowness of the sandy loam in these localities is no doubt the result of the removal of most of the dune in this area during previous construction of the access road into the lighthouse area. No cultural materials were encountered in any of these auger holes, and it thus appears that the drainage culverts will be located outside the archaeological site boundary.

Fenceline

The route of a new fence along the north side of the headland was tested through the excavation of 13 auger holes (Line F). The first nine holes produced cultural materials; the last four holes did not. The upper levels of most of these holes contained gravels introduced during the lighthouse occupation. The shell midden begins about two meters south of F1 and continues south-southeast to F9. The shell deposit is thickest between F1 and F4. In F5 through F8, only pockets of shell were encountered, mixed with the dark sediments containing fire-cracked rock and charcoal that characterize the edge of the shell midden. The intensity of human occupation along this portion of Line F is reflected in the high P value produced from a soil sample (35LNC62-F1-16) from 150-160 cm below surface in F1 (see Chapter 2). The remaining auger holes along Line F (F10-F13) reflect historical disturbance, involving removal of the upper sandy deposits and planting of sod, in some places directly over the orange sand. Recent debris was common in these shallow sediments.

Dune Tests

Sand dunes in the middle of the parking lot and south of the restroom facilities were initially thought to represent remnants of the original landscape at Yaquina Head. Originally part of one landform, these dunes are now separated by a spur of the access road leading into the lighthouse area. Seven auger holes (G1-G7) were excavated to test for the presence of cultural materials in the middle dune. All seven were dug through dune deposits to underlying orange sand or clay soils which, based on previous auger and unit excavations, are known to underlie cultural deposits on the headland.

Another 13 auger holes (I1-I13) were placed to the east of the middle dune. Nine of these holes were located in disturbed areas around the restroom facilities where, due to previous removal of dune sands, only shallow sandy deposits overlie the orange sands or other culturally-sterile sediments. Four other holes (I10-I13), however, resulted in deep tests of the dune remnant in this area. All four were dug through dune deposits to the underlying sterile orange sand or clay soils. The only noteworthy discovery was a charcoal-bearing layer at 140-160 cm below surface in I11.

No prehistoric cultural materials were recovered from any of the auger holes in the dune areas. The considerable extent of the disturbance from construction of the access road and parking lot indicates that this portion of the headland does not retain much of its natural integrity. However, the occurrence of charcoal well below the surface in two auger holes, significantly in C1 and to a lesser extent in I11, suggested that the lower deposits might still be intact. The presence of this charcoal prompted further testing at these localities with excavation units later in the 1989 investigations.

South Face Testing

An earlier description of the archaeological site at the tip of Yaquina Head noted the presence of sparse shell exposed on a trail leading down to tide pools below the south face of the headland (Philipek 1986a). Four auger holes (J1-J4) were placed between the parking lot and the edge of the headland. All four were deep tests extending through sandy loam to underlying orange sand or clay deposits. Aside from some shell in J2, no firm evidence of prehistoric occupation was encountered in any of these auger holes. The worn, broken shell in J2 probably represents a secondary deposit disturbed from its original context during parking lot construction.

Site Definition

A series of eight auger holes (H1-H8) was placed west of the known site area along the headland's north face to establish the extent of cultural deposits in that direction. H1, H2, H3, H4, H5, and H7 contained evidence of prehistoric occupation in the form of fire-cracked rock, sparse shell, and charcoal. Human influence on the sediments along this portion of Line H is reflected in a high P value obtained from a soil sample (35LNC62-H5-1) from 190-200 cm below surface in H5 (see Chapter 2). H6 and H8 contained charcoal, but no other indications of prehistoric occupation, and appear to be off the site.

A noteworthy discovery in H3 was evidence of a burned zone indicated by a dense charcoal concentration at 230-255 cm similar to that observed in C1 on the south side of the dune in the middle of the parking lot. No cultural materials were recovered in association with this charcoal concentration. Charcoal from 230-240 cm below surface in H3 produced a radiocarbon assay of 5140 ± 70 RCYBP (Beta-37495). Chemical testing of a soil sample (35LNC62-H3-26) from this concentration yielded only a moderate P value, supporting the inference that this charcoal is not related to human occupation (see Chapter 2).

Three more auger holes (K1-3) were excavated south of the line of auger holes employed to test the route of Utility Trench A, where shell deposits had been encountered in A5 and A7. Below the sod and road gravels in K2 a dark cultural deposit containing an obsidian flake, fire-cracked rock, and charcoal was encountered at a depth of 100-150 cm, but only a single shell fragment was found. A similar dark deposit was encountered in K1 at a depth of 150-200 cm, but no clear indications of occupation were found. K3 (CC) was then placed halfway between Line A and K1 and K2. The same dark cultural deposit, but no shell, was encountered at this location. These auger tests thus indicate that the shell midden extends for only a short distance (less than 5 meters) south of Line A. However, the dark non-shell-bearing cultural deposit extends for at least another 10 m from the shell midden observed in A5 and A7.

Finally, four more auger holes (AA, BB, DD, EE) were excavated between Utility Trench A (Auger Line A) and the fenceline (Auger Line F) to determine if the shell middens encountered along these lines were the same or separate deposits. Dark cultural deposits, but without shell, were encountered in AA and DD between 70 and 130 cm below the surface. In BB and EE, a shallow lens of shell was encountered at a depth of 90-110 cm. These results indicate that the shell middens along Line A and Line F are only minimally connected to one another, and that they represent spatially discrete depositions of shell on the headland.

Auger Testing Summary

A total of 78 auger holes was excavated during the auger testing program, involving the removal and screening of 1355 auger levels of fill. Much of this auger testing was done in an effort to locate previously undiscovered areas of occupation on the headland. Of the 78 auger holes excavated, 30 encountered apparent evidence of prehistoric occupation, while the remaining 48 did not. The results of the auger testing indicate that the bulk of the prehistoric cultural deposits on Yaquina Head are confined to the area west of the present parking lot. Auger testing within the parking lot and remnant sand dunes failed to encounter definite evidence of prehistoric occupation, but test pits were later excavated to establish more firmly whether intact cultural deposits were present deep below surface in the dune areas.

Prehistoric cultural materials occur in both shell midden and non-shell cultural deposits. Evidence from the auger testing suggested that two spatially discrete shell middens are present on the headland. The larger shell deposit is exposed along the north cliff face of Yaquina Head; the edge of this deposit is situated along Line F. A smaller shell deposit is centered along Line A. The larger shell midden was previously investigated in 1986; the smaller shell midden had not been previously identified or investigated.

AREA A

Area A refers to the shell midden and adjacent non-shell cultural deposits exposed along the headland's north face (Figure 3-2). This area was the focus of previous excavations during the 1986 season at Yaquina Head. This area was further investigated in 1989 beginning with excavation units placed along the route of the new fenceline. These excavations were later expanded into a sizable block area in

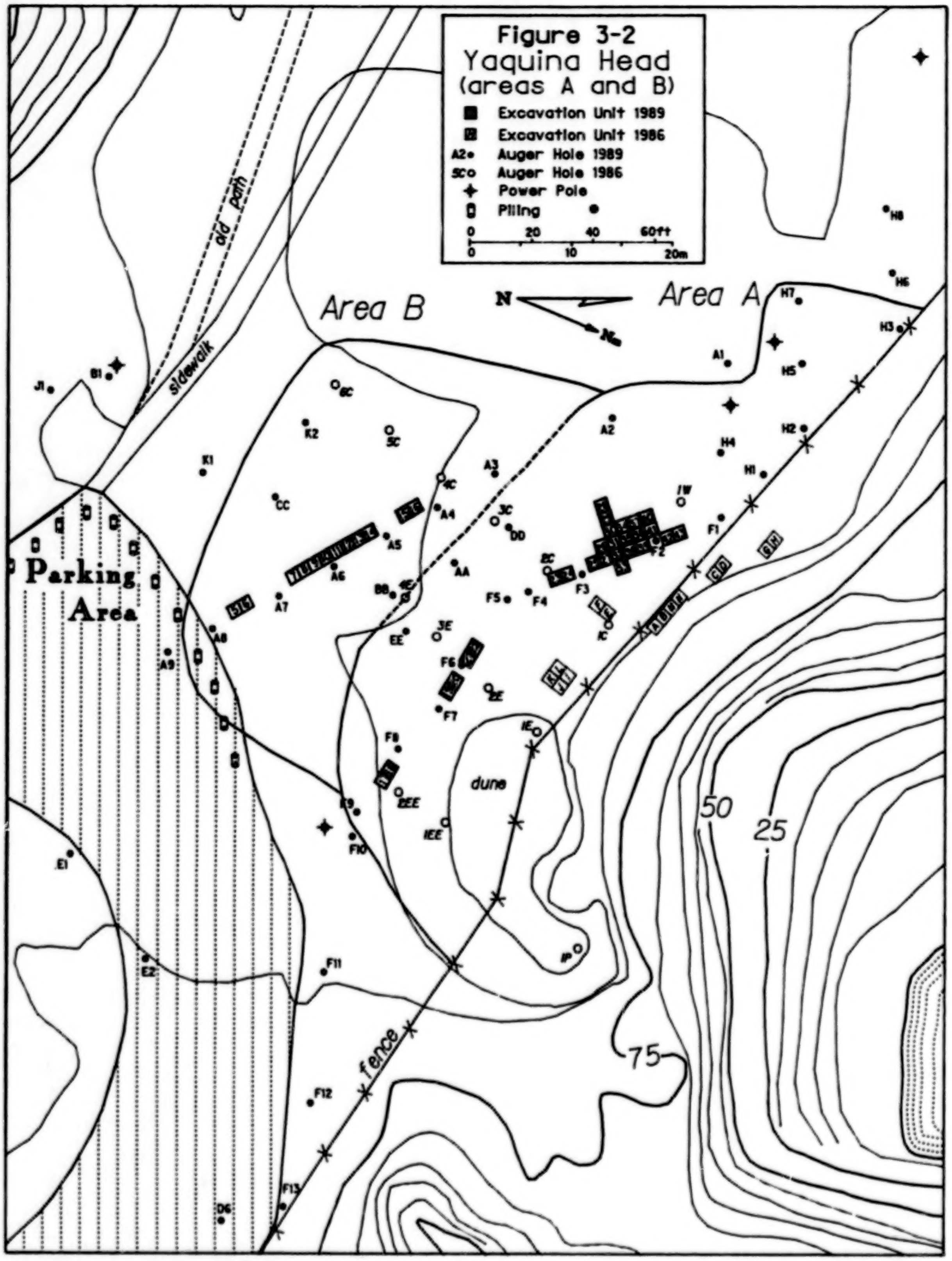

Figure 3-2. Location of test pits and auger holes in Areas A and B.

order to document an extensive living surface adjacent to the shell midden.

Excavation Narrative

A series of 1 x 1 meter units arranged in 1 x 2 meter trenches was placed at intervals along the new fenceline route within the boundaries of the cultural deposit as determined by the auger testing program. Excavation of these units indicated that the new fence would run along the south edge of the shell midden exposed in the headland's north face. Shell deposits were encountered in units 19 through 24 as well as in units 42 and 43. Shell was absent in units 36 and 39, but evidence of relatively intense occupation was found in the form of artifacts recovered from a dark non-shell cultural deposit.

The absence of shell in units 36 and 39 was noteworthy, as it suggested that the shell midden in this area might have been purposefully cleared away by the native inhabitants. Since evidence of a pithouse had been observed in the nearby cliff face profile during the 1986 investigations, the absence of shell in units 36 and 39 suggested that a semisubterranean house might be found in this area. A large block of units was subsequently excavated to assess this possibility. The results of these excavations do not support the idea that a pithouse was present, but considerable evidence of the existence of a living surface was found in this area.

The living surface (designated Feature 15) consisted of a distinctive 20-30 cm thick charcoal-stained soil layer that extended south from the shell midden. This soil layer was first observed in Unit 39 where the edge of the shell deposit ended abruptly. Further excavations in units 32, 36, 25, and 27 revealed the presence of the dark soil layer and the absence of shell over a 3-4 meter area between units 25 and 39. The dark soil layer resembled the compact charcoal-stained floors characteristic of prehistoric pithouses.

The initial units along the fenceline route were then expanded into a large block excavation area to determine if a pithouse was present (Figure 3-3). The dark soil layer was found to extend for at least 5 m southwest of the shell midden. Scattered fire-cracked rocks, vertebrate faunal remains, bone and stone artifacts, and debitage were all recovered from the dark soil layer. The soil layer occurred at the same elevation throughout the block excavation area. However, since the artifact concentration diminished within a few meters to the west without any evidence of another possible housepit edge, it was concluded that the dark soil layer was not a pithouse floor, but instead simply a living surface on which various activities were carried out.

The dark soil that delineated the living surface was present in all of the units within the block area that border the edge of the shell deposit, extending in some areas for at least five meters from the edge of the shell midden. To obtain some idea of the relative ages

Figure 3-3. View to the northwest of excavations in progress in the Area A block excavation.

of the shell midden and living surface, a charcoal sample from 90-100 cm below datum in the shell deposit in Unit 39 was submitted for radiocarbon dating, producing an assay of 3270 ± 60 RCYBP (Beta-37493). In comparison, a charcoal sample from the top of the soil layer comprising the living surface, obtained from 100-110 cm below datum in Unit 31, returned a radiocarbon assay of 3430 ± 70 RCYBP (Beta-37496). When left uncorrected, these dates do not overlap. However, when calibrated (Stuiver and Reimer 1986) the dates from the shell and living surface do overlap at two standard deviations. This situation suggests, then, that there is no great difference in the age of the deposition of the shell and the terminal occupation of the adjacent living surface.

In addition to the date of 3430 ± 70 RCYBP, another charcoal sample from the bottom of the soil layer, obtained from 140-150 cm below datum in Unit 38, yielded a radiocarbon assay of 4100 ± 60 RCYBP (Beta-37494). These two dates, then, bracket the age of the living surface. One other radiocarbon date was obtained in an effort to determine the age of the earliest occupation in Area A. Charcoal from 150-160 cm below datum in Unit 42 produced a radiocarbon assay of 6350 ± 140 RCYBP (Beta-37501). The charcoal on which this date was based was recovered in proximity to a large mammal bone, but no other

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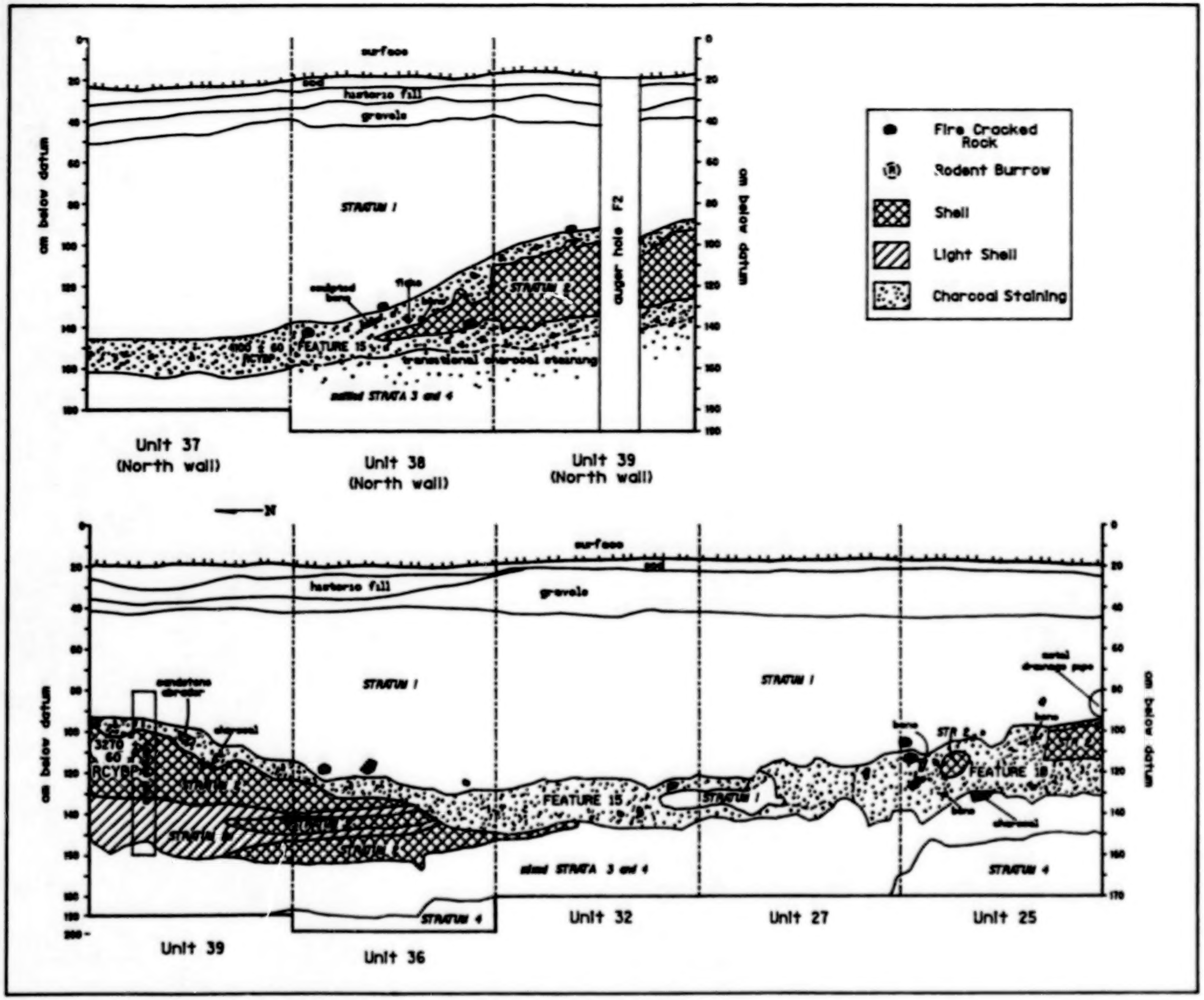

Figure 3-4. Stratigraphic wall profiles from the Area A block excavation: north wall (top) and east wall (bottom).

evidence of occupation was directly associated with this sample. Because of its small size this sample required extended counting time. For this reason, and because of its questionable association with cultural remains, there is reason to question whether this sample provides an accurate indication of the age of human occupation on the headland.

The presence of fire-cracked rock, charcoal, artifacts, and debitage associated with the dark soil layer thus indicates that in addition to the shell deposit an extensive living surface existed in Area A. Occupation of the living surface is bracketed by radiocarbon dates of approximately 3400 BP and 4100 BP. These dates seem to indicate that, for the most part, occupation of the living surface predates the deposition of the shell midden in Area A.

Shell was also absent in Units 17 and 18 at the eastern end of the new fenceline route, but some cultural materials were recovered in the dark non-shell cultural deposits. A large, completely burned tree limb and associated intensively burned area recorded as Feature 16 was found at the bottom of these deposits in Unit 18. This burned tree limb, identified as Sitka spruce, produced a radiocarbon assay of 3990 ± 60 RCYBP (Beta-35151). While this date is within the time span established for human occupation on the headland, no cultural materials were found in association with the limb, nor was any evidence such as cut marks observed on the limb itself to suggest direct association with the prehistoric inhabitants.

Stratigraphy

The stratigraphy of the shell midden in Area A was described and illustrated in the report of the 1986 investigations (Minor et al. 1987:23-27). Three basic cultural strata were recognized: Stratum 1, a dark sandy deposit overlying the shell midden; Stratum 2, the shell midden; and Stratum 3, a lighter-colored silty loam underlying the shell midden. A general description of the stratigraphy of the shell midden in Area A taken from the 1986 project report is repeated in Table 3-3. Selected profiles of the walls in the block excavation are shown in Figure 3-4. Profiles of the walls in other units in Area A are shown in Figures 3-5 and 3-6.

As described above, however, cultural strata lacking shell occur around the periphery of the shell midden. A profile observed in the west wall of Unit 35 is typical of the stratigraphy encountered in the non-shell portion of the block excavation in Area A (Table 3-4). At this location, 36 cm of historic fill overlie the original soil surface. Below the historic fill was about 90 cm of Stratigraphic Unit F. Unit F has A horizon development and is anthropically enriched. Below this was about 55 cm of Stratigraphic Unit E sediment that is relatively high in silt and clay, and has developed A and B horizons. Below Unit E is Stratigraphic Unit D, which corresponds to archaeological Stratum 4, comprised of culturally-sterile sandy sediments.

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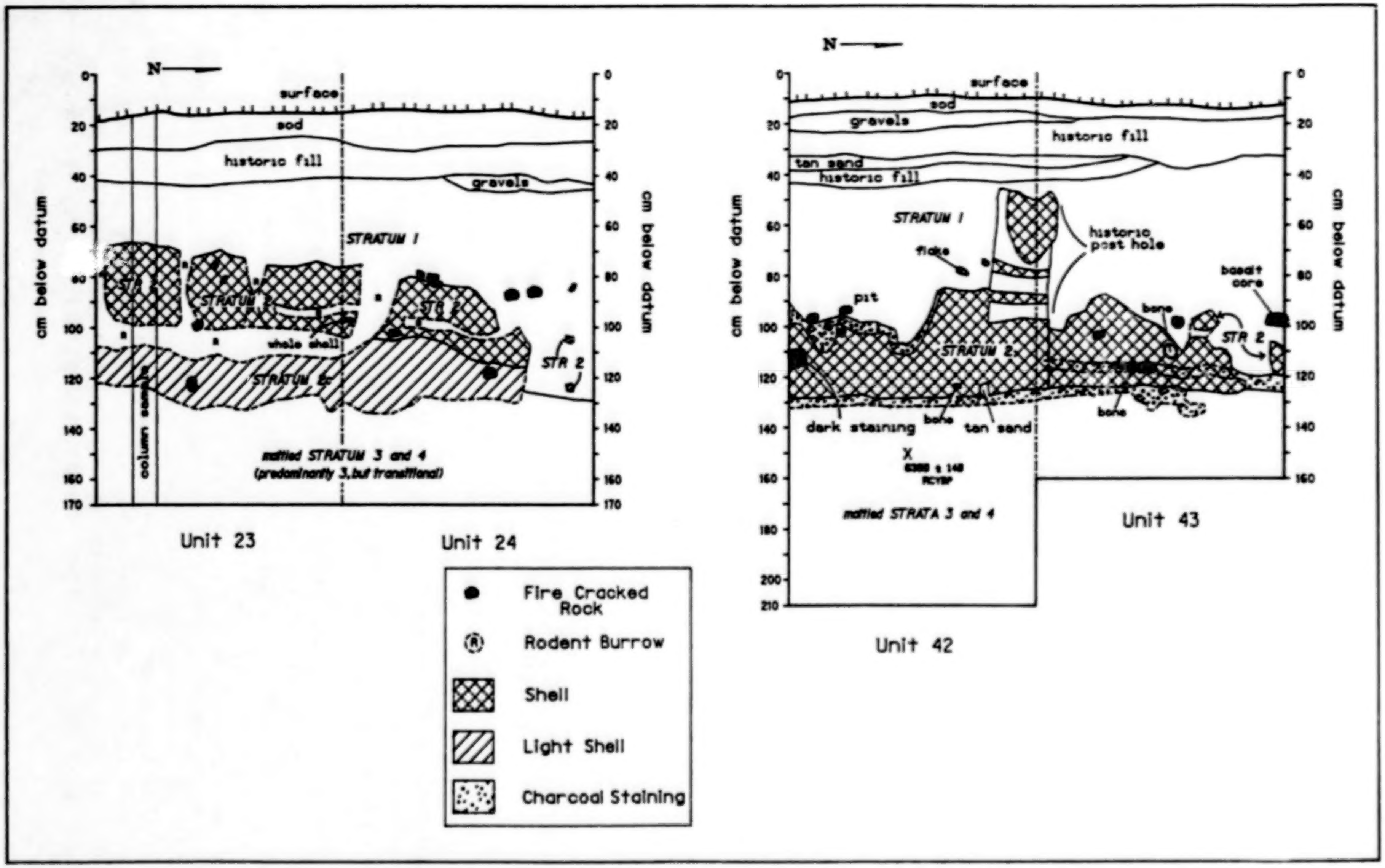

Figure 3-5. West wall profiles of units 23-24 and units 42-43 in Area A.

Table 3-3. General stratigraphy of the Area A shell midden during 1986 excavations (description by P.F. McDowell).*

Stratum	Cultural Significance	Laboratory Description
0	Sterile eolian sand overlying the cultural deposit	0.5-1.0 m thick layer of very dark brown (10YR 2/2 moist) loamy fine sand; weak soil structure; fine roots; medium acid (pH 5.4-6.1)
1	Cultural stratum overlying shell midden; probably of eolian origin	Black loamy fine sand (typically 10YR 2/1 moist, 10YR 3/2 dry), darker than Stratum 0; moderate to weak soil structure; very friable; neutral pH
2A	Upper shell deposit	Shell layer dominated by large, broken and whole shell fragments with a little fine black organic-rich matrix; mildly alkaline (ph 7.6)
2B	Lower shell deposit	Shell layer dominated by smaller, more broken or decayed shell fragments than in Stratum 2A; fine, black, organic-rich matrix; mildly alkaline (pH 7.8)
3	Cultural stratum underlying shell midden; eolian sand from dune on marine terrace	Black to dark yellowish-brown sandy loam; weak soil structure; friable; moderately alkaline (pH 7.9); equivalent to B horizon of soil
4	Sterile eolian sand (?) underlying cultural deposits	Dark brown sandy loam; color grades from very dark brown (10YR 2/2 moist) near the top to dark yellowish-brown (10YR 3/4 moist) at depth; weak soil structure in upper part; friable; mildly alkaline (pH 7.6-7.8); equivalent to lower B or C horizon soil
5	Sterile eolian or beach sand (?) underlying cultural deposits	Strong yellowish-brown (10YR 3/6 moist) loamy sand; firm and brittle; mildly alkaline (pH 7.6)

* from Minor et al. 1987:27; depths of strata vary across site; cf. McDowell 1987:15

In portions of the site where shell deposits (Stratum 2) were absent, it was often difficult to tell where Stratum 1 left off and Stratum 3 began. Because of mixing between the stratigraphic units, boundaries were difficult to distinguish on the basis of particle size distributions alone. At Profile 35, the project geomorphologist placed the boundary between Stratigraphic Units F (fine sandy loam) and E (silty loam) at 122 cm (Table 3-4). This location corresponds to the top of the A horizon, recognized as a "living surface" and recorded as Feature 15 in the field. The A horizon, which extends from 122-155 cm, is strongly anthropically enriched. At Profile 35, the boundaries between stratigraphic units F and E are also marked by strong discontinuities in the content of titanium (see Chapter 2).

Cultural Features

Of the 18 cultural features recorded during the 1989 excavations, 13 were found in Area A. The cultural features were assigned numbers in the field based on the order in which they were discovered. For the

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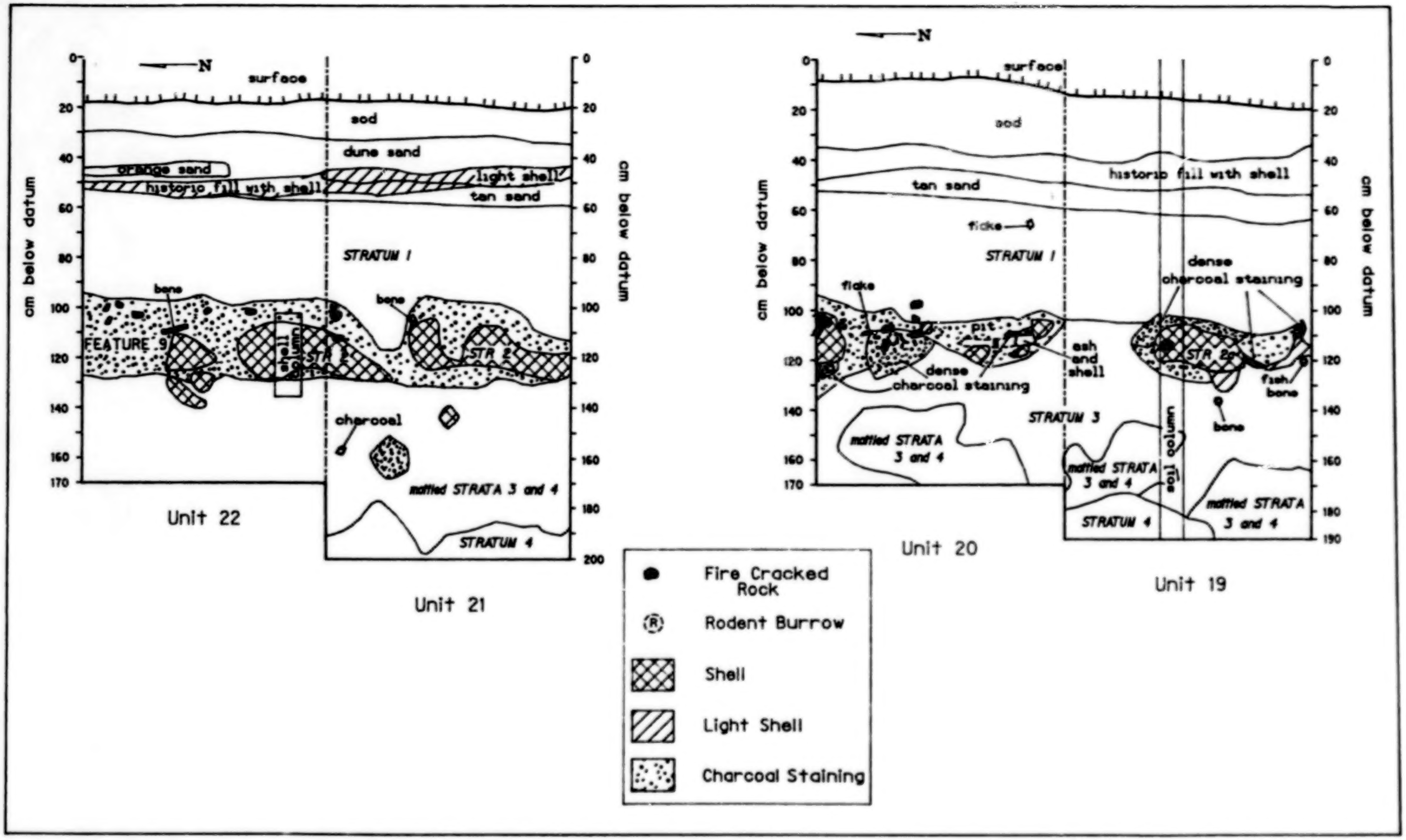

Figure 3-6. East wall profiles of units 19-22 on the edge of the shell deposit in Area A.

sake of consistency with the field records, the original feature numbers are retained here.

Feature 4 consisted of a large number of fire-cracked rocks and flakes scattered across the top of the shell midden more or less throughout units 42 and 43. The shell deposit in these units slopes downward at a pronounced angle to the west; the feature began at 55 cm below surface and sloped to a depth of 95 cm below surface. The shell deposit is very thin along the west wall of the two units, indicating that this is the west edge of the shell midden in Area A. An historic post hole, exposed in the west wall profile, penetrated the shell deposit and resulted in the deposition of a small pocket of shell above the main shell deposit. A total of 17 lbs of fire-cracked rock, 5 basalt flakes, 2 chert flakes, and one small siltstone abrader (43-6/2-F14-1) were found lying directly on the shell. The fire-cracked rock in this feature was not clustered as in a hearth, but distributed randomly as if in a secondary refuse deposit.

Feature 5 was a concentration of whale bone uncovered within the shell deposit at a depth of 110-120 cm below surface in Unit 43. This bone had been cut or chopped into large angular pieces and piled into a discrete cluster surrounded by a very dense, fragmentary shell deposit. The bone cluster was concentrated in the south half of the unit. This was the only concentrated cluster of bones encountered, but individual large chunks of cut bone were scattered throughout the shell deposit in this unit. No artifacts were directly associated. This feature thus apparently represents a locality where whale remains were discarded after butchering. It was not possible to identify the species of whale represented by these bones.

Feature 6 was a concentration of fire-cracked rocks within Stratum 1 sediments on top of the shell midden in Unit 39 and the east half of Unit 38. The shell deposit in Unit 39 began at approximately 80 cm below surface, and sloped to a maximum depth of approximately 125 cm to the west in Unit 38 where the edge of the shell midden was encountered. Fire-cracked rock from this feature included 19 lbs from Unit 39, and another 5.5 lbs from Unit 38. A wedge made from an elk metapodial (39-9/2-1), a chert manuport (38-9-12/1-F6-1), 4 chert, and 4 basalt flakes were directly associated with this feature.

The fire-cracked rocks in Feature 6 were not clustered as in a hearth but, as in Feature 4, were distributed randomly as if in a secondary refuse deposit. The shell deposit in this area was very uneven; pockets of dark charcoal-stained soil occurred in deep holes and crevices in the top of the shell. It was the abrupt edge of the shell deposit in Unit 39 that first suggested the possible presence of a pithouse in this area. Subsequent excavations in these units more fully exposed the dark non-shell cultural deposit of the living surface (Feature 15).

Feature 7 was a concentration of fire-cracked rock (2 lbs), bone and antler, and three whole shells encountered at approximately 70-80

Table 3-4. Description of stratigraphy in the west wall of Unit 35 (description by P.F. McDowell).

Unit	Horizon	Depth (cm)	Description
NA	A1	0-16	Upper part of historical fill; light brown gravelly sandy loam; weak medium platy to weak medium granular structure; slightly hard; common rounded pebbles and angular rock fragments; many fine roots; few charcoal fragments; abrupt smooth lower boundary; sample 35LNC62-3-1
NA	A2	16-26	Middle part of historical fill; light brown very gravelly sandy loam; structureless; friable; angular rock fragments, forming a distinct clast-supported layer at base and scattered less densely (matrix-supported) throughout; many fine roots; abrupt smooth lower boundary; sample 35LNC62-3-2
NA	A3	26-36	Lower part of historical fill; tan fine sandy loam with gravels; structureless; friable; gravel lens and burned lenses within this horizon; metal artifacts; few fine roots; abrupt, smooth lower boundary; sample 35LNC62-3-3
F	2Ab1	36-57	Stratum 1; medium brown sandy loam; weak, coarse angular blocky to structureless; friable; common fine roots; very few medium pores; little bioturbation; gradual smooth lower boundary; sample 35LNC62-3-4
F	2Ab2	57-90	Stratum 1; medium brown sandy loam with more silt than above; weak, coarse and medium angular blocky structure; friable; common fine roots; very few medium pores; gradual smooth lower boundary; sample 35LNC62-3-5
F	2Ab3	90-122	Stratum 1; dark brown sandy loam with more silt than above; weak, coarse and medium angular blocky; friable, firm; some fine roots; very few medium pores; very few, very fine pebbles of rounded basalt and fragments of cemented orange sand; very few charcoal fragments, mainly in lower part; clear smooth lower boundary; sample 35LNC62-3-6
E	3Ab	122-155	Stratum 3; living surface (Feature 15); very dark brown heavy sandy loam; moderate, medium and coarse angular blocky structure; friable, firm; common charcoal fragments, up to 1 cm across; some fine roots; common fire-cracked rock (matrix-supported); fire-croacked rocks are broken rounded basalt cobbles, 2 to 10 cm diameter; clear smooth lower boundary; sample 35LNC62-3-7
E	3Bw	155-176	Stratum 3; dark reddish-brown heavy sandy loam; weak, coarse and medium angular blocky structure; friable, firm; few fine roots; few subangular fragments of cemented orange sand, 1 to 3 cm across; few charcoal fragments; sample 35LNC62-3-8
E/D	4B/C	176-200	Stratum 3; strong reddish-brown heavy sandy loam; common chunks of orange cemented sand, up to 15 cm across; abrupt, irregular lower boundary; sample 35LNC62-3-9
D	4C	200-210	Stratum 4; orange cemented sand; soft to brittle in upper 10 cm; hard, unpenetrable below 210 cm; sample 35LNC62-3-10

cm below surface within the shell deposit in Unit 23. This feature, which covered a 67 x 64 cm area, appears to represent a butchering locus, as it included faunal elements identified as deer (8) and elk (2), as well as elements identifiable simply as large mammal (44). Three clusters of fish bones were also associated; these included elements identified as surfperch (1), rockfish (1), lingcod (3), greenling (2), and unidentified fish (7). The three whole shells were identified as gaper clams (*Tresus* sp.). Associated artifacts included a used basalt cobble flake (23-7/2-F7-1), a worked antler (23-7/2-F7-5), and 2 chert and 2 basalt flakes.

Feature 8 was a loose cluster of fire-cracked rock encountered at a depth of approximately 80-90 cm below surface on top of the shell midden in units 21 and 22. The shell in these units occurred primarily in large pockets surrounded by a very dark, rock-strewn, non-shell cultural deposit. Although shell was distributed across Unit 22, denser pockets were restricted to the north and east corners. Similarly, Unit 21 contained shell in the northeast half only. The fire-cracked rock totaled 25 lbs in Unit 22 and 14 lbs in Unit 21. The only faunal material directly associated was a deer long bone fragment. Three basalt flakes were the only associated artifacts. Like Features 4 and 6, this feature appears to represent a secondary deposit of refuse on top of the shell midden.

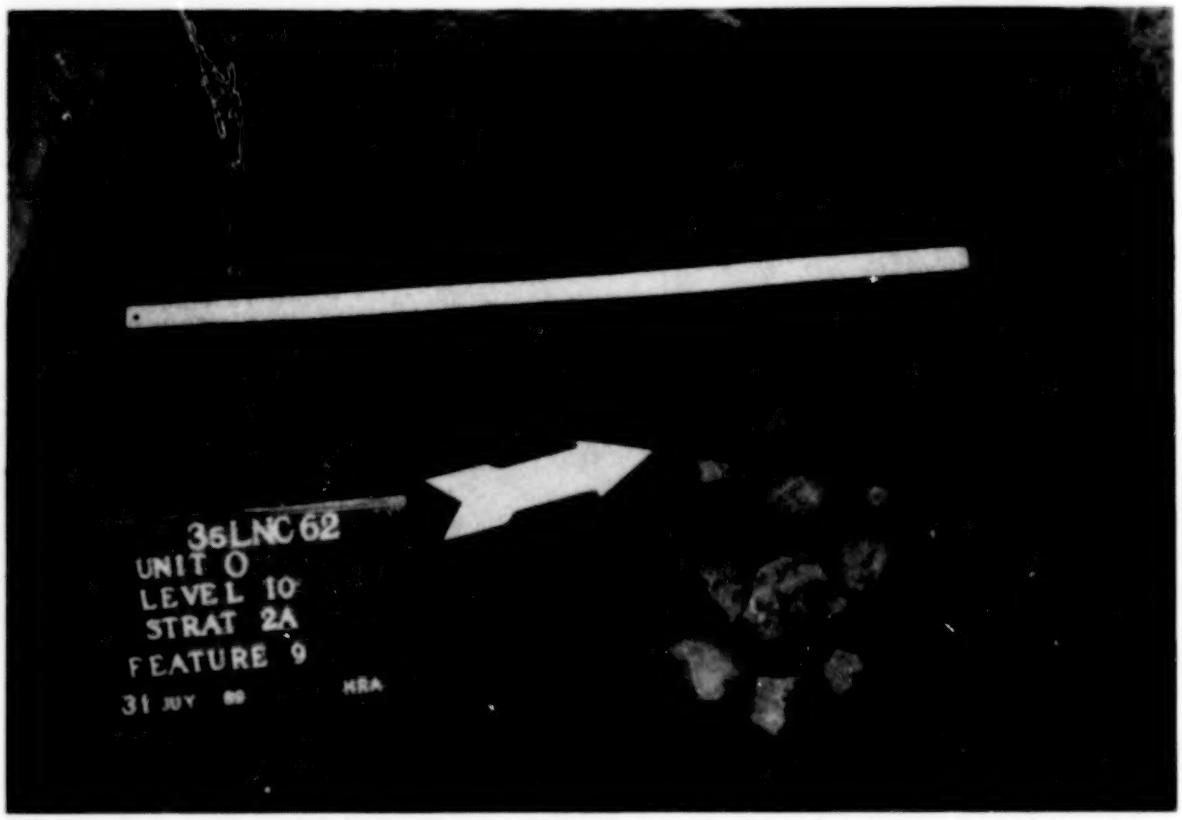

Figure 3-7. View of Feature 9, a fire-cracked rock cluster within the shell deposit in Unit 22.

Feature 9 was a discrete cluster of large fire-cracked rocks within the shell deposit in Unit 22 (Figure 3-7). This cluster was immediately below the rock layer of Feature 8. This rock cluster measured approximately 50 x 50 cm and was associated with a dense pocket of shell exposed in the east wall of the unit. The fire-cracked rocks first emerged at about 100 cm and continued to about 120 cm below surface, and appeared in profile to occur within a pit. This feature thus appears to have been a small firepit associated with the edge of the shell deposit. The rock cluster was made up of 19 rocks totaling 12 lbs. The only faunal material directly associated was one large unidentifiable bone. A single basalt flake was the only associated artifact.

Feature 10 consisted of a cluster of fire-cracked rock encountered within Stratum 3 sediments in Unit 25. This feature occurred between 100 and 120 cm below surface, and occupied an area roughly 70 by 100 cm, concentrated in the southeast portion of the unit. Situated adjacent to a shell pocket in the unit's southeast corner, the feature included a total of 34 lbs of fire-cracked rock. Fifteen whale bone fragments and two large mammal bone fragments were collected from among the rocks. An antler sleeve haft (25-10/1-F10-2) and a chert flake were directly associated. This feature thus appears to represent a locus where butchering and cooking of large mammals was undertaken.

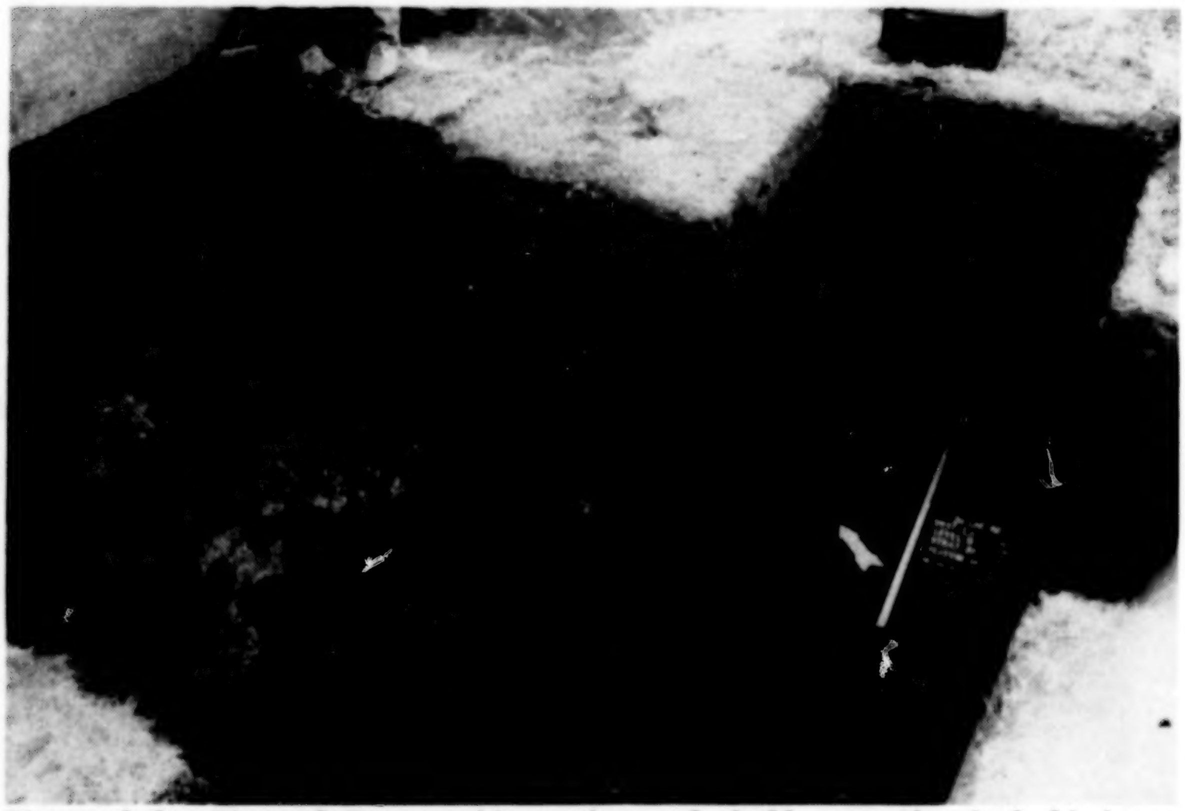

Figure 3-8. View of Feature 14, pockets of shell atop the dark living surface in Unit 33 (right).

Table 3-5. Summary of artifacts recovered from Feature 15.

	Material					
Artifact Class	Chert	Basalt	Obsidian	Sandstone	Antler	Total
Flake Tool Series						
Projectile Point			1			1
Drill		1				1
Bifaces	3					3
Graver	1					1
Used Flakes	3					3
Cobble Tool Series						
Hammers		8				8
Chopper		1				1
Wedge		1				1
Core/Debitage Series						
Cores	3	2				5
Debitage	296	45	7			348
Abrader Series						
Abraders				6		6
Bone/Antler Series						
Pendant					1	1
Figurine					1	1
Sleeve Haft					1	1

Feature 13 was a loose scatter of fire-cracked rock encountered within Stratum 1 sediments on top of the shell deposits in units 19 and 20. The shell in these units consisted only of small pockets occurring within the matrix of the dark non-shell cultural deposit. Encountered at 90-110 cm below surface, the fire-cracked rocks were distributed in no particular pattern throughout both excavation units, overlying the shell pockets and extending onto the surrounding dark soil. A total of 43 lbs of fire-cracked rock was recovered from this feature.

Faunal remains associated with Feature 13 included single elements representing elk, unidentified large mammal, and lingcod. Artifacts recovered in association with this feature include a used basalt cobble flake (19-10/2C-F13-1) found in Unit 19, and 9 basalt flakes found in

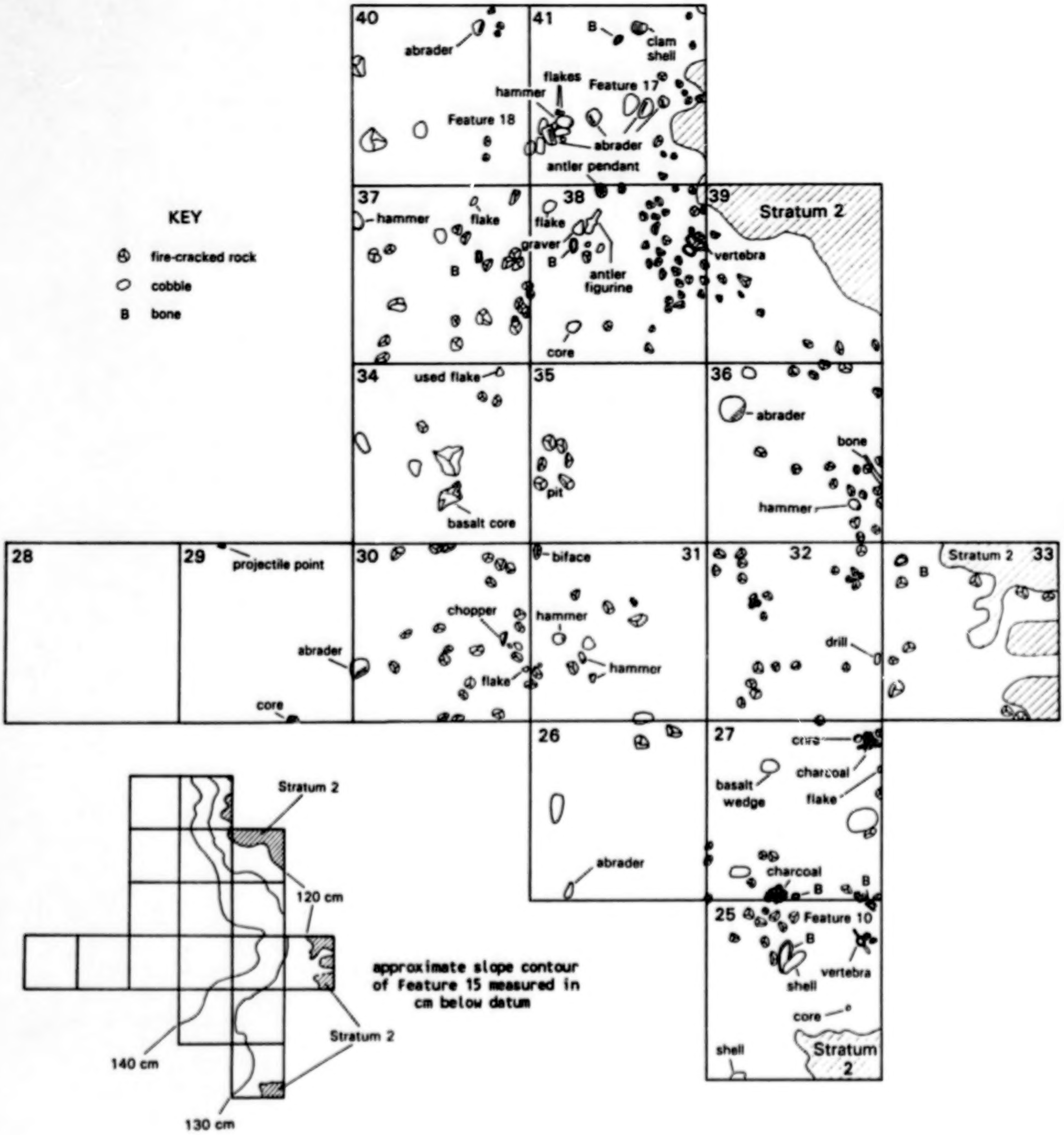

Figure 3-9. Planimetric view of tools and rock associated with Feature 15 in the excavation block of Area A.

Unit 20. The shell pockets in these units appeared to be a continuation of the southeast edge of the shell midden observed in nearby units 21 and 22. As the fire-cracked rocks were loosely scattered, this feature is interpreted as another secondary refuse deposit occurring on the periphery of the shell midden.

Feature 14 consisted of pockets of shell observed along the edge of the shell midden in Unit 33 (Figure 3-8). Because the abrupt termination of the shell deposit in nearby units 36 and 39 initially suggested the possible presence of a semisubterranean pithouse, particular attention was directed to documenting the edge of the shell deposit in Unit 33. From the main shell deposit to the north and east, three pockets of shell extended into Unit 33, beginning at a depth of about 100 cm on the east side and sloping to a depth of 130 cm on the west side of the unit. These pockets were separated by the dark soil of the living surface (Feature 15). A few fire-cracked rocks were observed on top of the shell, but no artifacts were directly associated. The extension of these shell pockets into Unit 33 indicated that the edge of the shell midden had not been truncated by a house pit. Instead, the dark soil of the living surface appeared simply to occupy a natural recess along the edge of the shell midden.

Feature 15 was the dark soil layer at the top of the Stratum 3 sediments on which a number of artifacts were recovered in situ (Figures 3-9 and 3-10). Because of its dark and compact nature and the way it terminated abruptly in units 36 and 39, this layer was initially thought to perhaps represent the floor of a semisubterranean pithouse. Subsequent excavations exposed the layer throughout a 17 square meter area in units 25 through 41. This feature did not extend into neighboring units 23 and 24 to the southeast or units 42 and 43 to the northwest.

Instead of encountering further evidence of an abrupt edge suggesting a housepit wall, however, the dark soil layer was found to interfinger with the shell in the units in which shell deposits were present (see Figure 3-4). Accordingly, this distinctive soil layer on which artifacts were situated was interpreted to represent an extensive living surface adjacent to the shell midden. An inventory of artifacts recovered from Feature 15 is presented in Table 3-5. The age of the occupation of this living surface is indicated by radiocarbon assays of 3430 ± 70 RCYBP (Beta-37496) from 100-110 cm below datum in Unit 31, and 4100 ± 60 RCYBP (Beta-37494) from 140-150 cm below datum in Unit 42.

Feature 16 was a large charred log and surrounding burned area encountered deep in Unit 18 on the periphery of the Area A cultural deposits. Subsequently identified as a Sitka spruce limb, this log was encountered at a depth of 140-150 cm below surface lying east-west across the southern portion of Unit 18. This feature occurred within the dark sediments of Stratum 3, with the bottom of the log situated at approximately 150 cm below surface resting on the orange sand of Stratum 4. The top of the limb was 10-20 cm below the last excavation level in which cultural remains (specifically, fire-cracked rock) were found. The sediments around the limb were intensely burned, leaving the soil a bright red-orange color. A charcoal sample from this limb produced a radiocarbon assay of 3990 ± 60 RCYBP (Beta-35151). Although this date is within the known time span of human occupation at this site, no cultural remains were directly associated with this feature.

Feature 17 refers to the top of the shell deposit and adjacent contact with the dark soil layer of the living surface (Feature 15) in Unit 41. The shell deposit extended from the east wall for 70 cm across the unit. The top of the shell appeared at about 80 cm along the east wall and sloped sharply to about 110 cm along its western margin. The shell deposit was dissected by pockets of dark sediments associated with the living surface (Feature 15), which extended from the edge of the shell westward into Unit 40. No artifacts were directly associated with the top of the shell deposit in Unit 41, but faunal remains attributed to Feature 17 included 15 medium and large mammal

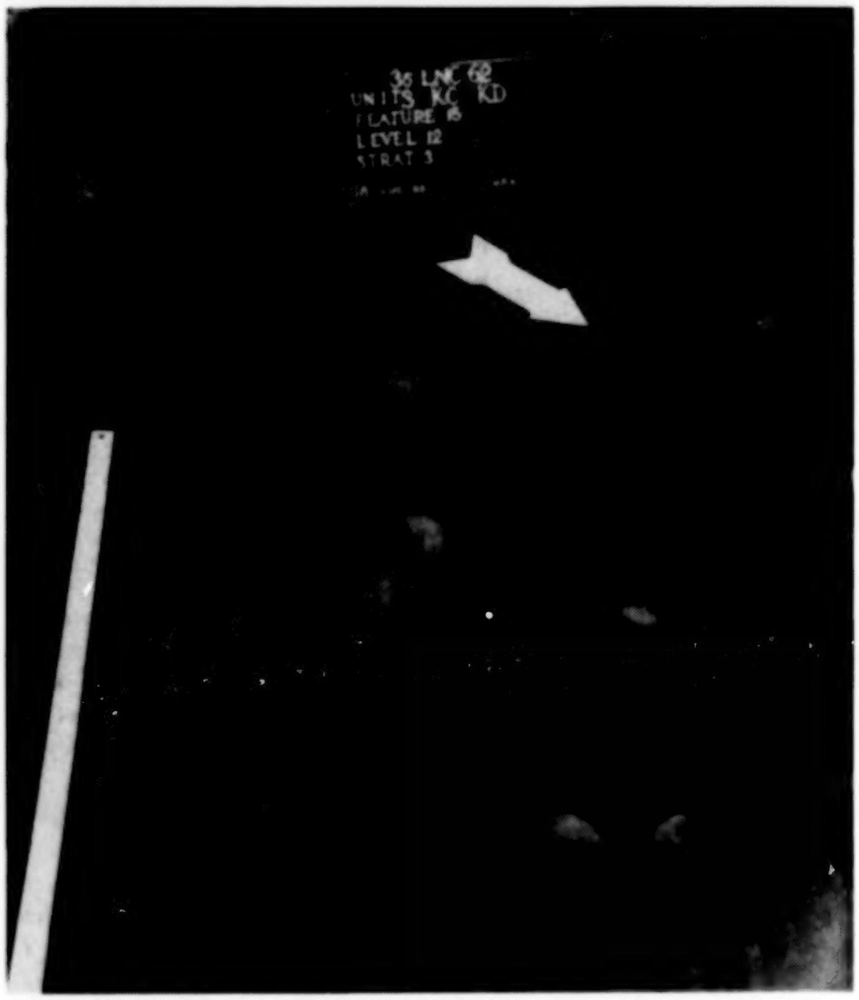

Figure 3-10. View of cultural materials exposed in situ on the living surface (Feature 15) in units 30 and 31.

bone fragments, one hake bone, and 2 unidentifiable fish bone fragments.

Feature 18 was a cluster of artifacts encountered within the dark non-shell sediments of Stratum 3 in Unit 41. The cluster occurred at a depth of 140-150 cm below surface within a 25 cm by 35 cm area at the edge of the shell midden. Included in the cluster were two sandstone abraders (41-15/3/F18-1, 41-15/3-F18-4), a hammer (4a-15/3-F18-2), an unmodified chert flake (41-15/3-F18-5), and three unmodified basalt cobbles. This feature was associated with the dark soil layer of Feature 15, and these artifacts are considered part of the tool assemblage recovered from the living surface at the edge of the shell midden.

AREA B

Area B refers to the shell midden and adjacent non-shell cultural deposits discovered during auger hole excavations along the route of Utility Trench A. Subsequent auger testing indicated that this shell deposit was for the most part spatially discrete from the shell midden exposed along the north face of Yaquina Head in Area A.

Excavation Narrative

Excavation units 5 through 14 were situated so as to sample the cultural deposits along the route of Utility Trench A (Figure 3-2). Units 7 through 14 were placed within the shell deposit as a continuous 1 meter wide trench 8 meters long (Figure 3-11). Units 5 and 6, at the south end, and units 15 and 16 at the north end of the corridor, failed to encounter the shell midden. These excavations did, however, sample the dark non-shell cultural deposit that extends beyond the edge of the shell midden.

Stratigraphy

The profile observed in the west wall of excavation units 7/8 (Figure 3-12) is typical of the stratigraphy encountered in Area B (Table 3-6). The upper 30 cm consists of historical fill and disturbed material. Below is Stratum 1, a 10 to 30 cm thick, dark, humus-rich, sandy soil that is part of the recent eolian deposits of Stratigraphic Unit F. A radiocarbon assay of 2750 ± 60 RCYBP (Beta-37499), obtained from 30-40 cm below datum in Unit 13, provides an idea of the age of the occupation in Stratum 1.

Stratigraphic Unit F is underlain by the shell midden deposits of Stratum 2, which were typically about 30 cm thick in these excavation units. Beneath the dense shell deposit was a 10 to 20 cm thick layer of dark, humus-rich sandy loam that contained a reduced amount of shell fragments designated Stratum 2c. This substratum is also part of Unit

Figure 3-11. View to northwest of excavations in the Area B trench.

F, the eolian sands. An idea of the age of this shell deposit was obtained by means of a radiocarbon assay of 3670 ± 70 RCYBP (Beta-37497), derived from charcoal collected from 60-70 cm below datum in Unit 13. This charcoal was associated with a firepit and bone/antler processing area designated Feature 12.

Beneath Stratum 2c was a 20-40 cm thick layer consisting of a mixture of archaeological Strata 3 and 4. Stratum 3 probably correlates with Stratigraphic Unit E; Stratum 4 is correlated with Stratigraphic Unit D. A radiocarbon assay of 4050 ± 60 RCYBP (Beta-37498) obtained from charcoal collected from 80-90 cm below datum in Unit 13 establishes the age of the occupation underlying the shell midden in Area B.

The stratigraphic sequence observed in Area B indicates that in this area deposition of Stratigraphic Unit F, the eolian sands, started before and continued after the occupation represented by the shell midden.

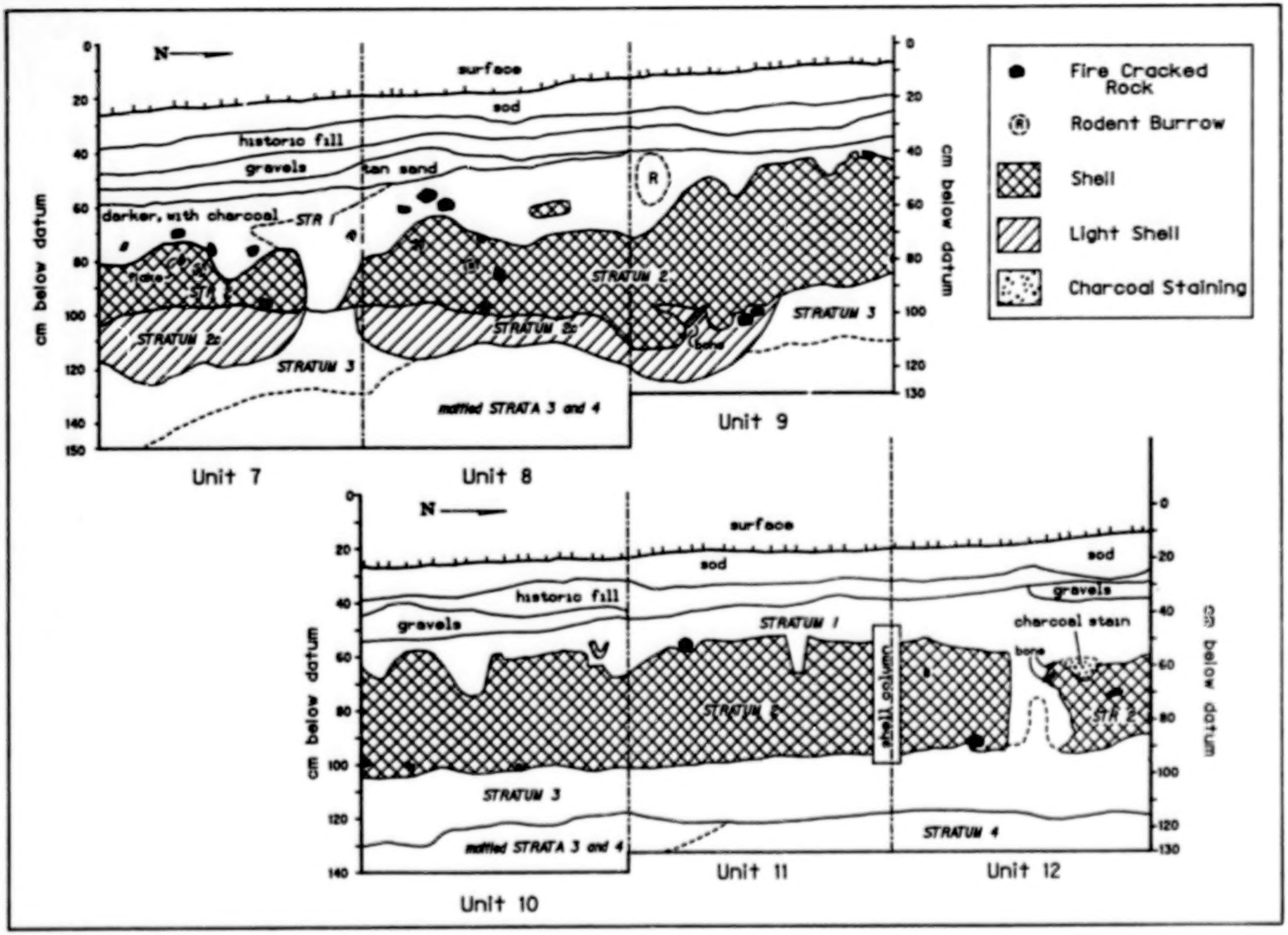

Figure 3-12. West wall profile of units 7-12 in Area B trench excavation.

Cultural Features

Five of the 18 cultural features recorded during the 1989 investigations were found in Area B.

Feature 1 consisted of three small clusters of fire-cracked rock and associated charcoal and cultural materials within Stratum 1 sediments overlying the top of the shell deposit (Stratum 2) at approximately 40-50 cm below surface in units 7 and 8. Cluster A covered a 38 x 20 cm area and consisted of 35 fire-cracked rocks (4 lbs). Cluster B covered a 56 x 40 cm area and included 15 large fire-cracked rocks (5 lbs). Cluster C covered a 60 x 40 cm area and consisted of nine fire-cracked rocks (3 lbs). A number of bones and scattered pieces of fire-cracked rock were also found lying directly over the shell deposit in these units, but they were apparently scattered randomly and not in direct association with the rock clusters.

Artifacts associated with Feature 1 included a basalt chopper (7-7/1-1) found with Cluster C, as well as 26 unmodified chert and 6 basalt flakes. Faunal remains recovered from Feature 1 included bone fragments identified as deer (2), sea otter (1), whale (6), large mammal (3), herring (1), and unidentified fish (2). Feature 1 thus appears to represent an area where butchering and cooking of animals took place.

Table 3-6. Description of profile from the west wall of units 7/8 (description by P.F. McDowell).

Unit	Horizon	Depth (cm)	Description
NA	A	0-30	Historical fill; light brown gravelly sandy loam; structureless; friable; angular rock fragments; many fine roots; metal artifacts; few charcoal fragments; abrupt smooth lower boundary
F	2Ab1	30-50	Stratum 1; black (10YR 2/1 moist) sandy loam; very dark gray (10YR 3/1) when dry; common pebbles of slightly weathered, orange-brown, igneous rock; few charcoal fragments; neutral (pH 7.1); equivalent to Stratigraphic Unit F; sample 35LNC62-CD-2
F	2Ab2	50-80	Stratum 2; shell midden; broken shell with a matrix of black (10YR 2/1) sandy loam; matrix is dark gray (10YR 4/1) when dry; some broken fragments of rounded cobbles; charcoal fragments
F	2Ab3	80-100	Stratum 2c; black (10YR 2/1 moist) sandy loam with fewer shell fragments; very dark brown (10YR 3/2) when dry; charcoal fragments; mildly alkaline (pH 7.7); sample 35LNC62-CD-2C
E/D	3B/C	100-130	Stratum 3/4; very dark brown (10YR 2/2 moist) sandy loam matrix (Stratum 3) with many fragments of weakly cemented sand (Stratum 4); matrix is brown (10YR 5/3) when dry; cemented sand is strong brown (7.5YR 4/8) to yellow-brown (10YR 7/6) when dry; cemented sand fragments are angular; mildly alkaline (pH 7.5); sample 35LNC62-CD-3/4

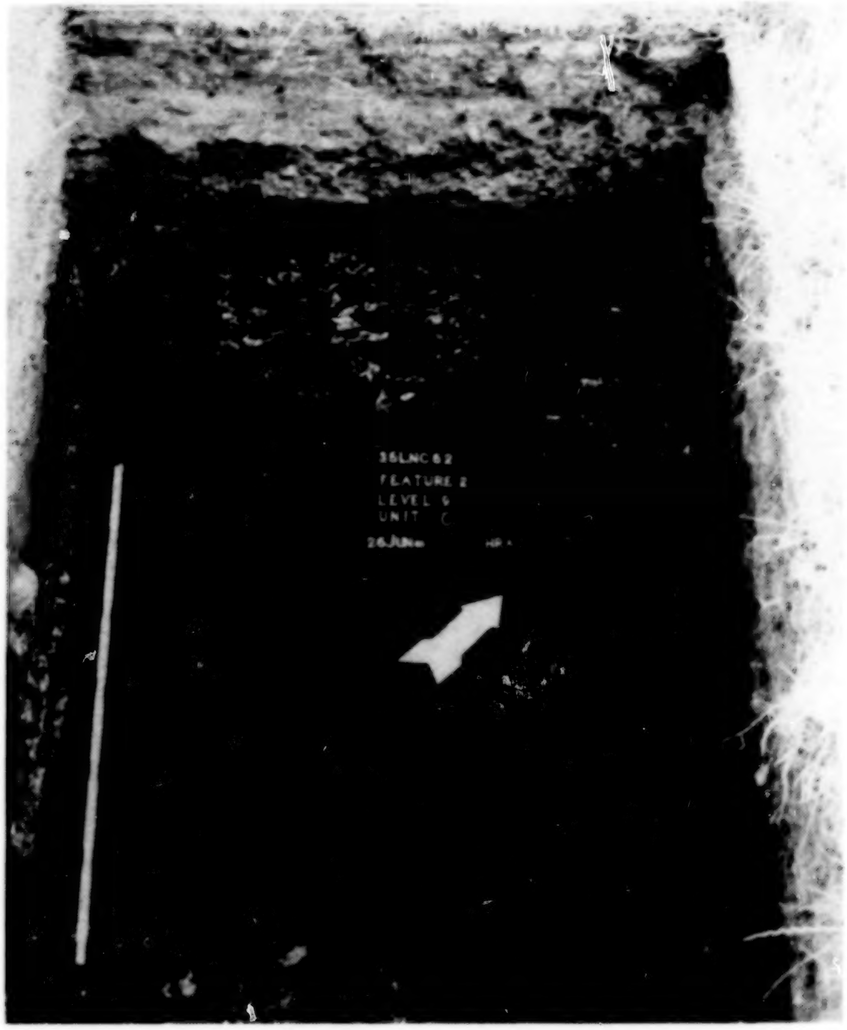

Figure 3-13. View of Feature 2, a fire-cracked rock cluster at the base of the shell deposit in Unit 8.

Feature 2 was a cluster of fire-cracked rock and associated faunal remains encountered at the bottom of the shell deposit (Stratum 2) in Unit 8 (Figure 3-13). These materials were distributed over most of the excavation unit at approximately 90-100 cm below surface. A total of 14 fire-cracked rocks (5 lbs) was recovered from this cluster. A crude chert biface (8-9/2-F2-1), a bone chisel (8-8/2-1), and two unmodified basalt flakes were directly associated. Animal remains associated with this rock cluster included bones identified as sea lion (2), sea otter (1), otariid (1), pinniped (1), and unidentified large mammal (14). Feature 2 was situated at the bottom of the dense shell midden (Stratum 2) in the dark charcoal stained and lighter scattered shell deposit referred to in the field as Stratum 2c. This feature is interpreted as another locus of butchering and cooking activity at the site.

Feature 3 consisted of a scatter of fire-cracked rocks and faunal remains within Stratum 1 sediments overlying the shell deposit (Stratum 2) in units 11 and 12. Situated just below historical road gravels, the top of the shell was uneven, with many small pockets of soil extending down into the shell. The feature covered most of these two units at approximately 40 cm below surface. A total of 21 lbs of fire-cracked rock was scattered across the top of the shell in these units. Associated artifacts included a chert core (11-4/1-F3-2), an antler spatulate (11-4/1-F3-1), a bone or antler chisel (12-4/1-F3-1), a used chert flake (11-4/1-F3-3), and one obsidian, 3 basalt, and 33 chert flakes.

Faunal remains associated with Feature 3 were abundant, including elements identified as deer (1), cervid (1), artiodactyl (1), whale (2), unidentified medium and large mammal (21), and unidentified bird (1). Fish were also well represented, and included elements identified as hake (17), rockfish (2), lingcod (2), greenling (9), sculpin (1), as

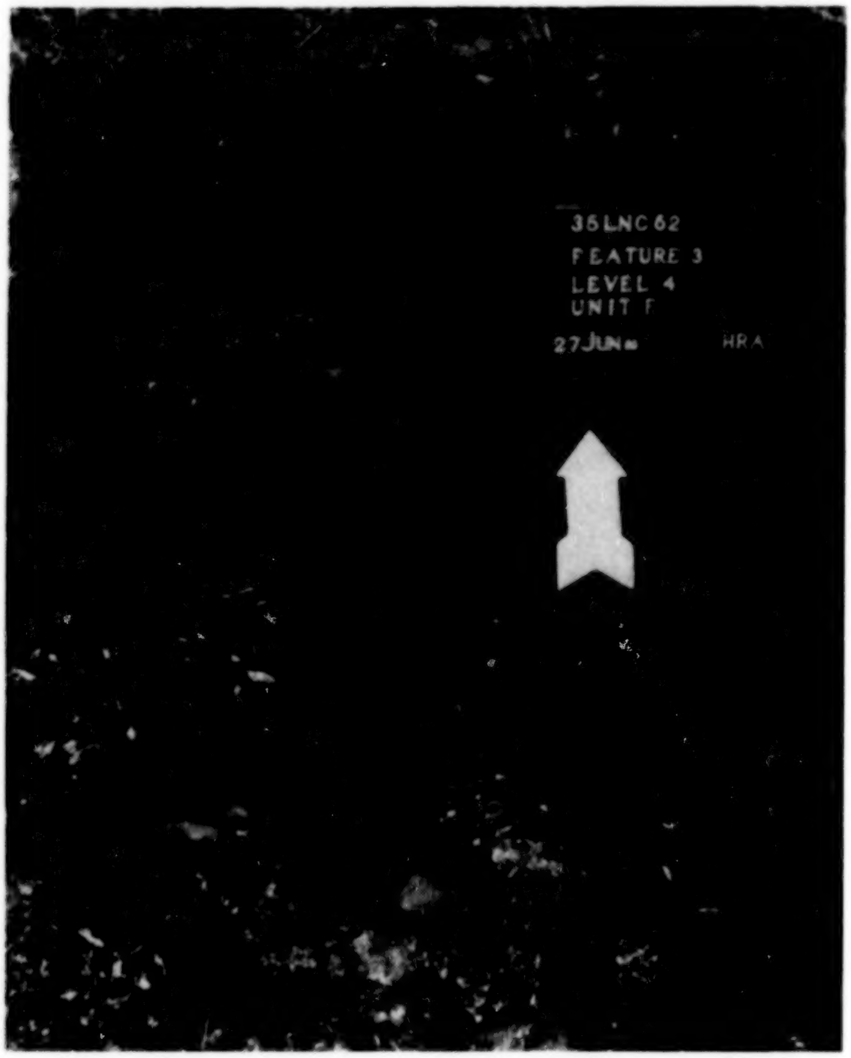

Figure 3-14. View of Feature 3, a scatter of fire-cracked rock and bone atop the shell deposit in Unit 12.

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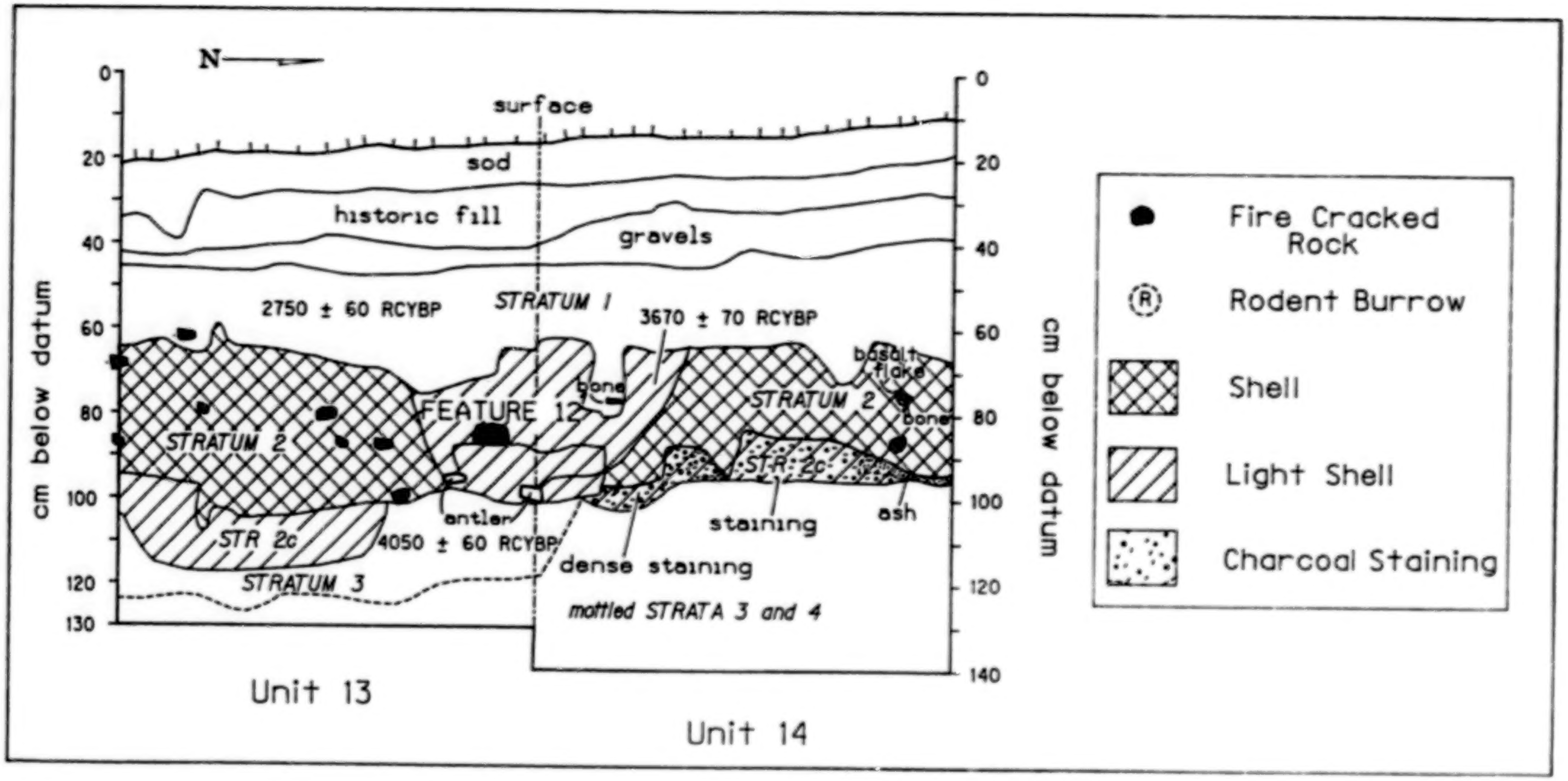

Figure 3-15. West wall profile of units 13 and 14 showing the Feature 12 firepit containing fire-cracked rock and bone.

Table 3-7. Description of east wall profile from Unit 1/2 in Area C (description by P.F. McDowell).

Unit	Horizon	Depth (cm)	Description
F	A1	0-21	very dark brown (10YR 2/3 moist) fine sandy loam; structureless; soft; common fine roots; few 1-2 mm horizontal tubules; abrupt, smooth lower boundary
F	A2	21-27	very dark brown (10YR 2/2 moist) fine sandy loam; weak medium subangular blocky, more compact than above; soft; possibly more fines than above; few charcoal fragments; common fine roots; few tubules; abrupt smooth lower boundary
F	Bw	27-33	dark brown (7.5YR 3/3 moist) fine sandy loam; weak medium subangular blocky; common fine roots; very few charcoal fragments; few tubules; abrupt, smooth lower boundary
F	C	33-63	dark yellowish brown (10YR 3/4 moist) fine sandy loam; weak, coarse subangular blocky; common fine roots, number decreasing toward bottom of horizon; very few fine charcoal fragments; few tubular ant holes, 2-3 mm diameter; few indistinct pockets (2-4 cm diameter) of darker material, probably burrow fill from above; clear smooth lower boundary
F	A1b	63-88	dark brown (7.5YR 3/3 moist) fine sandy loam; weak medium subangular blocky; soft, friable; few fine and medium roots; few ant holes as above; abrupt, smooth, lower boundary; moving down to lower area, on NW face: 88 cm boundary dips to 109 cm here
F	A2b	109-120	very dark brown (10YR 2/2 moist) loam; weak, medium subangular blocky; very few fine rock fragments and red-orange specks (bisque?); very few fine charcoal fragments; few fine roots; no tubules; abrupt, smooth, dipping lower boundary
F	AC	120-133	very dark gray brown (10YR 3/2 moist) sandy loam; mixed brown and yellow sand; mixture is subtle with color fading from one patch to next; abrupt, smooth lower boundary
F	A3b	133-144	very dark brown (10YR 2/2 moist) loam; weak medium subangular blocky; few fine roots; no tubules; abrupt, smooth, dipping lower boundary
F	AC	144-147	very dark brown (10YR 2/3 moist) sandy loam; similar to 120-133 cm; mixed brown and yellow sand; mixture is subtle with color fading from one patch to next; abrupt, smooth and nearly horizontal lower boundary
E	2A1b	147-185	black (10YR 2/1 moist) clay loam; weak coarse subangular blocky; soft; some charcoal fragments up to 5 mm across; indistinct inclusions of paler brown material, 4-6 cm across, probably burrow fills; few fine and medium roots; found 1 well-rounded pebble, about 2 cm diameter; clear, wavy lower boundary; sample 35LNC62-P1-10
E	2A2b	185-224	black (10YR 2/1 moist) clay loam; weak coarse subangular blocky; soft; some charcoal fragments; few fine and medium roots; similar to above, but no brown burrow fillings; possibly slightly darker than above; clear smooth lower boundary
E	2Bw	224-251	dark reddish brown and yellowish red (5YR 3/2 and 3/6 moist) sandy clay loam; mixture of orange burned earth, gray sandy clay loam, and black sandy clay loam; soft; few charcoal fragments; common medium roots; abrupt, wavy lower boundary; radiocarbon dated at 5330 ± 110 RCYBP (Beta-37495)
E	2A3b	251-256	black (10YR 2/1 moist) sandy clay loam; similar to above except for color; abrupt dipping (to SW) lower boundary; sample 35LNC62-P1-13
E	2A4b	256-276	very dark brown (7.5YR 4/3 moist) sandy clay loam; structureless; soft; isolated charcoal chunks in unstained matrix; abrupt lower boundary; sample 35LNC62-P2-14
D	3Cm	276-280+	orange cemented sand

well as unidentified fish (37). A large number of other faunal remains (55) were unidentifiable. This feature obviously represents another area in which butchering and cooking of animals took place. Some of the chert flakes exhibit a fire-affected appearance, suggesting that heat treatment of lithic material might have been another function of Feature 3.

Feature 11 was most likely a continuation of Feature 3 extending to the west into Unit 13. Likewise occurring within Stratum 1 sediments overlying the shell deposit, Feature 11 consisted of a loose scatter of fire-cracked rocks (6 lbs) and bone fragments distributed throughout the unit at a depth of approximately 40-50 cm. A number of artifacts were associated, including an antler beam wedge (13-6/2-F11-1), a chert scraper (13-6/2-3), a bird bone tube bead (13-6/2-1), another worked bone (13-6/2-2), as well as chert (9) and basalt (11) flakes. As was the case in units 11 and 12, the top of the shell in Unit 13 was very uneven, with deep pockets of non-shell-bearing soil running north and south through the unit. The shell deposit began to slope to the north toward the edge of this midden, which auger testing indicated was less than four meters to the north. The long deep linear pockets of non-shell-bearing soil were a common feature along the edge of the shell deposit, and may have been caused by rain runoff during the time the shell mound was exposed to the elements.

Feature 12 was a concentration of fire-cracked rock and faunal material encountered below Feature 11 in the shell deposit in units 13 and 14. Rocks and bones were distributed more or less throughout Unit 13 and into the adjacent eastern half of Unit 14 at a depth of approximately 50-70 cm below surface. The profile of the west wall of units 13 and 14 indicates the presence of a pit approximately 25 cm deep (Figure 3-15). A total of 40 lbs of fire-cracked rock was recovered from within the feature. Charcoal from Feature 12, collected from 60-70 cm below datum in Unit 13, yielded a radiocarbon date of 3670 ± 70 RCYBP (Beta-37497).

Associated with Feature 12 were 4 sandstone abraders, a bird bone whistle fragment (14-7/2-3), a worked antler tine (13-8/2-F12-3), 3 other pieces of worked bone, and 5 chert and 10 basalt flakes. Animal bones identified from this feature included deer (2), elk (5), artiodactyl (3), beaver (1), bobcat (2), harbor seal (3), and medium and large mammal (17). Fish were also well represented, including hake (17), herring (1), salmonid (1), surfperch (1), lingcod (1), greenling (10), sculpin (1), and unidentified fish (60). Unidentifiable faunal remains were also numerous (75). Feature 12 appears to represent a bone and antler processing area, apparently associated with a firepit.

AREA C

Area C refers to the portion of the headland to the east of the shell middens where previous access road and parking lot construction

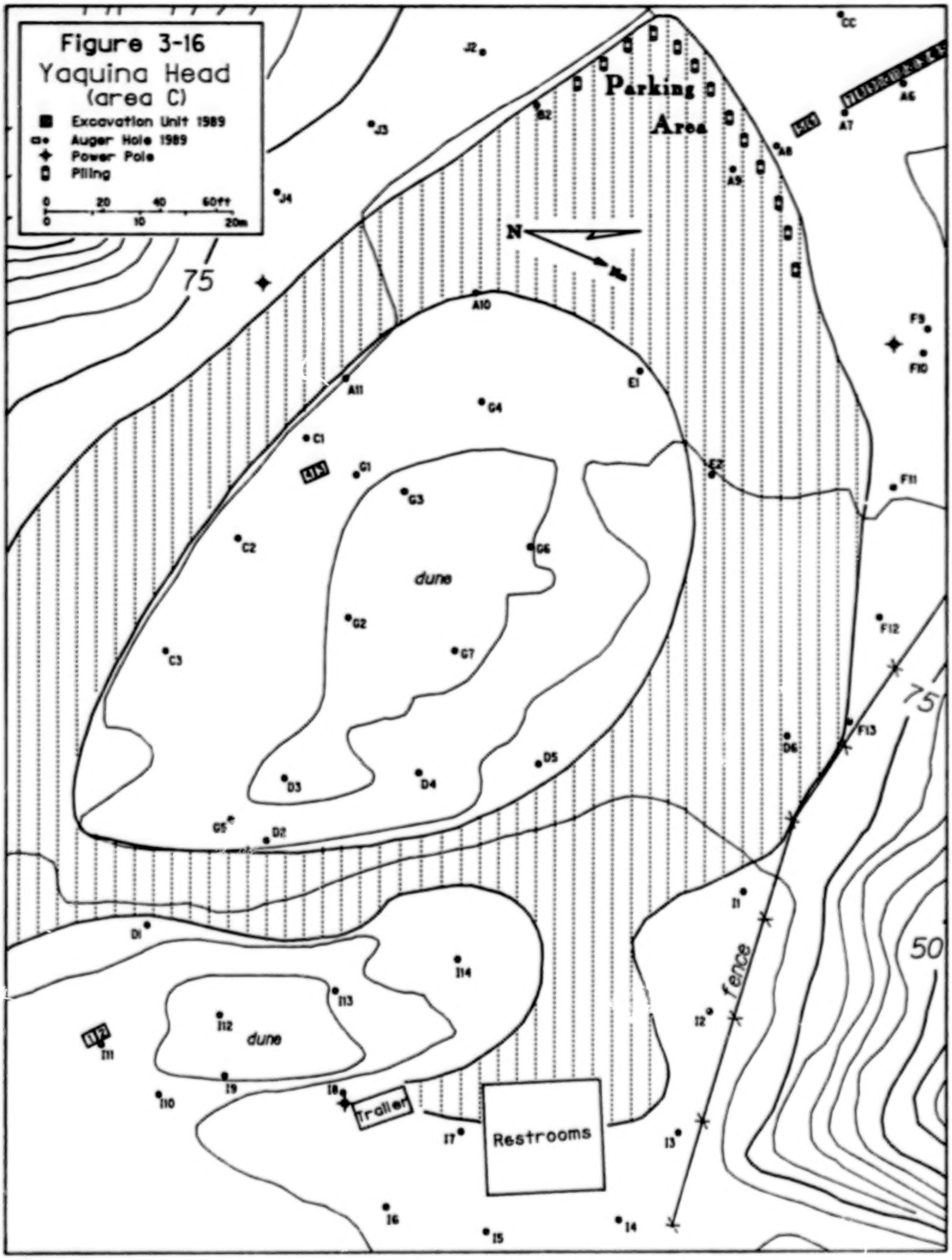

Figure 3-16. Topographic map of Area C showing the locations of auger holes and excavation units.

have considerably altered the original landscape (Figure 3-16). This area was intensively tested during the auger hole excavation phase of the investigations. The results confirmed that the uppermost sediments over most of this area have been disturbed or, in fact, even removed, during previous construction. However, the discovery of dark soil layers and burned zones in the dune remnants suggested that intact cultural deposits might still be present deep below the ground surface. Accordingly, further test pit excavations were conducted.

Excavation Narrative

Two adjacent 1 x 1 m excavation units (units 1 and 2) were placed on the high dune south of the BLM trailer and restroom facilities next to auger hole I11, in which a charcoal-bearing layer had been found at 140-160 cm below the ground surface. In units 1 and 2, 11 flakes were recovered, along with recent trash, between 30 cm and 50 cm below surface. Although the units were dug to a maximum depth of 284 cm, no other evidence of occupation was found.

However, a burned zone was encountered at 224-251 cm below surface in these units. The absence of prehistoric occupation at lower depths was confirmed by the results of chemical analysis of soil samples from 147-185 cm (35LNC62-P1-10), 251-256 cm (35LNC62-P1-13), and 256-276 cm (35LNC62-P1-14) below surface, none of which produced P values high enough to indicate human enrichment (see Chapter 2). Charcoal from the burned zone at 224-251 cm below surface yielded a radiocarbon assay of 5330 ± 110 RCYBP (Beta-37500).

Two more contiguous 1 x 1 m excavation units (units 3 and 4) were then placed on the dune in the middle of the parking lot adjacent to auger hole C1, in which another burned zone had been found deep below the ground surface. A single flake was recovered from 90-100 cm below surface in Unit 4, just above a buried gravel road. Interestingly, chemical analysis of soil samples from 130-168 cm (35LNC62-P2-7) and 168-211 cm (35LNC62-P2-8) below surface both produced P values high enough to suggest human enrichment (see Chapter 2).

Old photographs (e.g., Figure 1-2) and maps indicate that this gravel road represents an early road to the lighthouse. The presence of this buried road indicates that the dune remnant in the middle of the parking lot has been heavily disturbed by construction at the lighthouse over the last century. Below the gravel road, excavations in units 3 and 4 encountered a burned zone at 220-250 cm, overlying the sterile orange sand layer. No evidence was recovered, however, to indicate that this burned zone was cultural in origin. This situation was confirmed by the results of chemical analysis of a soil sample (35LNC62-P2-9), which did not produce a P value high enough to suggest human enrichment (see Chapter 2).

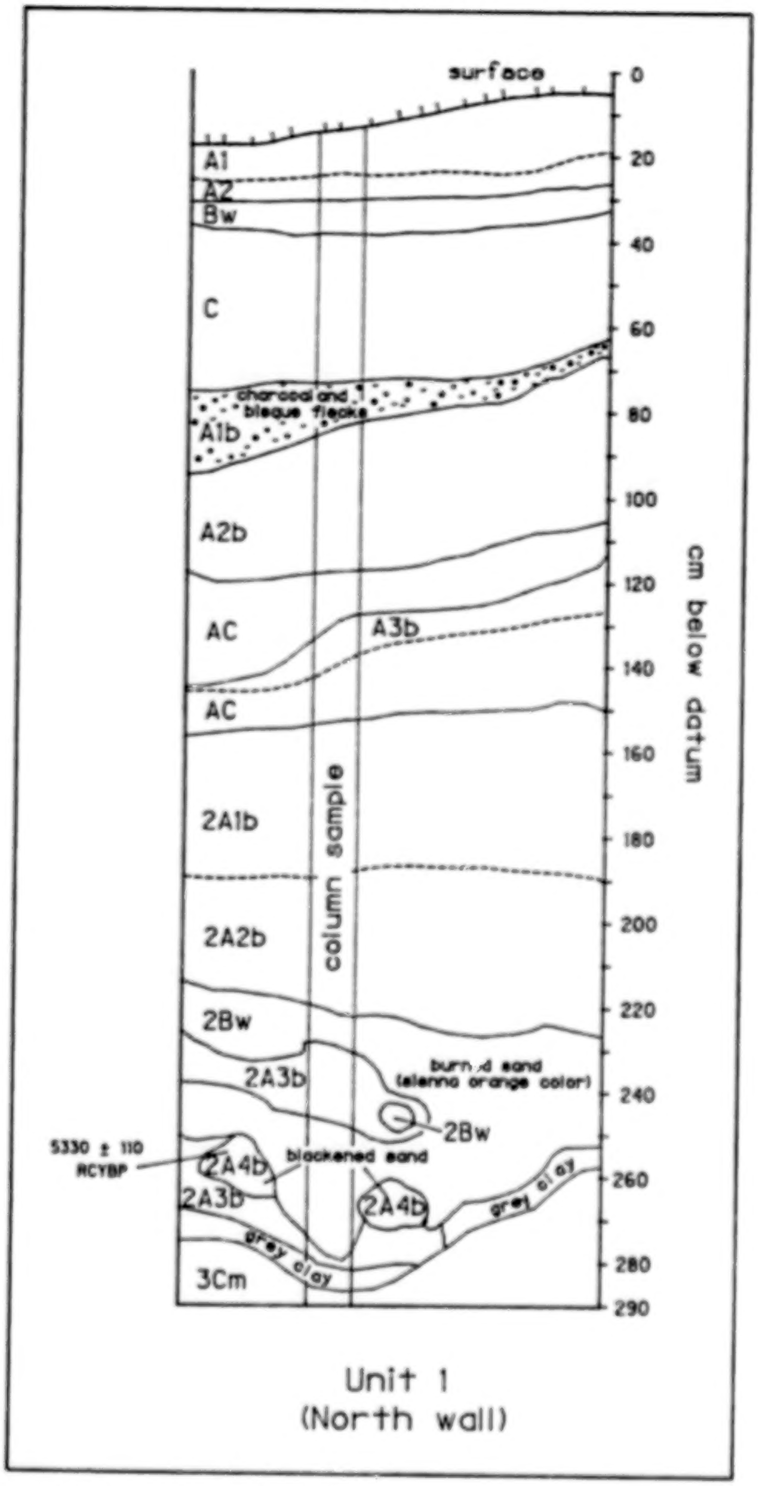

Figure 3-17. Stratigraphic profile of the north wall of Unit 1 in Area C.

Stratigraphy

The profile from the north wall of Unit 1 (Figure 3-17) is typical of the stratigraphy in Area C (Table 3-7). The stratigraphy in these excavation units consists of sandy sediments of Stratigraphic Unit F above 147 cm, and a clayey deposit that probably correlates with Unit E below 147 cm. Although largely unproductive in terms of evidence of prehistoric occupation, these excavation units contained two important stratigraphic features. The thick layer of Stratigraphic Unit F included two buried A horizons, and the profile also shows an example of the deep burned zone that was recognized during auger testing. This burned zone occurs at 224-251 cm. The sediments just below at 251-276 cm contained charcoal, but the matrix was relatively unstained.

As noted above, charcoal identified as pine wood from this burned zone produced a radiocarbon assay of 5330 ± 110 RCYBP (Beta-37500). This zone probably did not originally contain wood that burned, but charcoal was mixed into it after the fire. In addition to the absence of cultural materials, the results of soil chemistry analysis indicate that samples from this burned zone (35LNC62-P1-13, 35LNC62-P1-14) do not have P values high enough to indicate human influence (see Chapter 2). This burned zone thus appears to have a natural rather than cultural origin.

RADIOCARBON DATING

Twelve radiocarbon determinations were previously obtained as a result of the 1986 project at Yaquina Head (Minor et al. 1987:36-41). Ten more samples recovered from the 1989 excavations were submitted for radiocarbon analysis. In all, then, 22 radiocarbon dates are now available from 35LNC62 All of the dates from the 1989 project are based on charcoal. Information on the provenience of these dates is summarized in Table 3-8.

One radiocarbon date was obtained from Stratum 1, the cultural deposit above the shell midden. Based on charcoal recovered from Unit 13 in the Trench Area, this date of 2750 ± 60 RCYBP is fully consistent with previous determinations from Stratum 1, which ranged from 2310 ± 60 RCYBP to 3200 ± 70 RCYBP (Minor et al. 1987:38). (An even earlier assay of 3400 ± 240 RCYBP was placed with Stratum 1 in the report of the 1986 investigations; this date is now thought to more appropriately pertain to Stratum 3.)

Two radiocarbon assays were obtained from Stratum 2, the shell midden deposits. One assay of 3270 ± 60 RCYBP was from Area A, while the other assay of 3670 ± 70 RCYBP was from Area B. The assay from Area A is essentially the same (overlapping at two standard deviations) as dates previously obtained from Stratum 2, all of which were from the shell midden along the north face of the headland (Area A). The assay from Area B, however, is roughly 400 years older than any of the previously obtained dates. The greater age of this sample supports the notion, previously suggested by the spatial distribution of the shell deposits, that Area B includes a separate shell deposit from that along the north face of the headland.

The remaining seven radiocarbon dates from the 1989 investigations were obtained from Stratum 3 underlying the shell middens. Five of these dates are from Stratum 3 in Area A. Two assays of 3430 ± 70 RCYBP and 4100 ± 60 RCYBP bracket the age of the living surface

Table 3-8. Summary of radiocarbon dates from the 1989 investigations.

Strat. Unit	Arch. Stratum	Exc. Unit	Depth Below Datum (cm)	Date RCYBP	Material	Laboratory Number	Association
AREA A:							
F	2	39	90-100	3270 ± 60	Mostly Douglas fir; trace of pine	Beta-37493	Charcoal from shell midden
F	3	31	100-110	3430 ± 70	Mostly lodgepole pine; traces of Douglas fir and Rose family	Beta-37496	Feature 15, living floor
E	3	18	130-140	3990 ± 60	Sitka spruce	Beta-35151	No direct association with cultural material
E	3	38	140-150	4100 ± 60	80% lodgepole pine; 20% Douglas fir; trace of red cedar	Beta-37494	Feature 15, living floor
E	3	42	150-160	6350 ± 140*	Douglas fir	Beta-37501	Below shell, in assoc. with bone
E	3?	H3	230-240	5140 ± 70	Pitch-coated spruce	Beta-37495	Low burned zone; not associated with cultural material
AREA B:							
F	1	13	30-40	2750 ± 60	Douglas fir; trace of red cedar	Beta-37499	Above shell
F	2	13	60-70	3670 ± 70	Lodgepole pine	Beta-37497	Feature 12 in shell midden
E	3	13	80-90	4050 ± 60	Pitch-coated Sitka spruce; trace of alder	Beta-37498	Just below shell
AREA C:							
E	3?	1	210-260	5330 ± 110	Pine	Beta-37500	Low burned zone; not associated with cultural material

* Beta-37501 was a small sample given extended counting time (four times the normal amount) to reduce the statistical error as much as practical.

(Feature 15). A third assay of 6350 ± 140 RCYBP was obtained from below the living surface, and a fourth assay of 3990 ± 60 RCYBP was obtained from the Sitka spruce limb (Feature 16) uncovered on the periphery of Area A. Lastly, charcoal from the burned zone in auger hole H3 produced a radiocarbon assay of 5140 ± 70 RCYBP.

Two more radiocarbon assays refer to Stratum 3 in Area B and Area C. Charcoal underlying the shell midden in Area B produced an assay of 4050 ± 60 RCYBP. Charcoal from the burned zone in Area C produced an assay of 5330 ± 110 RCYBP.

Aside from the assay of 6350 ± 140 RCYBP, the radiocarbon dates from the portion of Stratum 3 sampled during the 1989 excavations are generally consistent with those previously obtained from this stratum. As noted in Table 3-8, however, three of these dates are not directly associated with cultural materials. Of these, the assay of 3990 ± 60 RCYBP from the Sitka spruce limb can reasonably be interpreted as associated with human occupation, based on the high P value of associated sediments and the occurrence of this assay within the time range of several other dates from cultural features at the site.

In contrast, the assays of 5140 ± 70 RCYBP and 5330 ± 110 RCYBP from the burned zones in Areas A and C, respectively, are probably not associated with human occupation. In addition to not being directly associated with cultural materials, chemical analysis of associated sediments failed to produced P values high enough to suggest human enrichment of soils around these dates (see Chapter 2). Finally, although based on charcoal collected from the same unit/level as a large bone exposed in the unit sidewall, the assay of 6350 ± 140 RCYBP is of such a greater magnitude than the rest of the radiocarbon dates as to raise serious doubts that it relates to human occupation of the headland. Further interpretation of the radiocarbon dates from the 1989 project, considered in the context of previous radiocarbon dating of 35LNC62, is presented in Chapter 9.

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CHAPTER 4

MOLLUSCAN REMAINS

by Debra C. Barner

Exposures along the eroding north face of the headland indicate that the main shell midden at Yaquina Head is composed primarily of sea mussel (*Mytilus californianus*). In order to examine the contents of this shell deposit in detail, midden analysis was carried out on samples collected during the 1986 excavations. Analysis of four column samples and two lens samples, supplemented by "grab samples" collected during the course of the excavations, confirmed that sea mussel was the primary midden constituent, accounting for approximately 80% of the identifiable remains by weight. Horse barnacle, piddock, goose barnacle, and black katy chiton were less intensively exploited, and a range of other molluscan species are also represented in the midden (Barner 1987).

In view of the midden study already conducted, further examination of the midden composition in conjunction with the 1989 investigations was limited to analysis of three more column samples, as well as identification of grab samples from the excavation units. The objective of this analysis was to examine midden composition in areas of the headland not examined during the previous investigations. The column samples selected for analysis were intended to sample both of the shell deposits present on the headland: the main shell midden exposed along the headland's north face (Area A), and the newly identified shell midden encountered during the Utility Trench excavations (Area B). A comparative collection and several keys (Morris 1966; Cornwall 1975; Griffith 1975; Keep 1935; Quayle 1978; Rehder 1981) were used in the identification of the molluscan species represented at Yaquina Head.

COLUMN SAMPLE ANALYSIS

The column samples analyzed from Yaquina Head measured 10 x 10 cm and were removed in 10 cm levels. Standard procedures for midden analysis were followed in analyzing the column samples (e.g. Meighan et al. 1958; Hester and Conover 1970). The samples were dried and then passed through 6.3 mm (1/4-inch) and 3.15 mm (1/8-inch) screens. The contents of the screens were sorted into the major component categories of molluscs, bone, charcoal, rock, cultural, and residue. The material represented in the residue was too small to permit accurate sorting and

Table 4-1. Weight (in grams) of midden components from Column 11/12.

	Depth below surface (cm)					
Component	30-40	40-50	50-60	60-70	70-80	Total
Shellfish	186.8	425.4	563.5	488.3	346.7	2010.7
Bone	1.1	2.7	0.7		0.8	5.3
Cultural					2.2	2.2
Roots	0.1	0.1				0.2
Rock	25.1	7.7	22.9	7.6	1.1	64.4
Charcoal	0.6	2.7	2.2	1.4	0.8	7.7
Residue	715.8	901.8	878.3	804.1	847.2	4147.2
TOTAL	929.5	1340.4	1467.6	1301.4	1198.8	6237.7

was not further analyzed. Previous midden analyses have shown that the time spent in the lab sorting shell increases exponentially with the decrease in screen size (Koloseike 1968). After sorting, the midden components were weighed to 0.1 gram accuracy.

Column 11/12

A column taken from Units 11/12 sampled the deposit in the small shell midden crossed by Utility Trench A (Area B). The results of the separation of this column into major midden constituents are presented in Table 4-1. The shellfish species represented in the column sample are listed by weight and percent in Table 4-2.

Seventeen taxa were represented in Column 11/12. Mussel was the major component of the column, representing over 71% of the total shellfish weight. The mussel taxon is composed of both sea mussel and bay mussel (*Mytilus edulis*). During sorting it became apparent that bay mussel was present, but only in small quantities. However, because of the degree of fragmentation, the two species could not be consistently separated.

The barnacle taxon (*Balanus* sp.) appeared to be mostly horse barnacle (*B. cariosus*), but again, because of the degree of fragmentation, the species could not always be readily determined. Barnacles accounted for nearly 18% of the shellfish by weight. Piddock clam (*Penitella penita*) at 5.0%, rock dwelling purple (*Nucella lamellosa*) at 1.7%, and goose barnacle (*Pollicipes polymerus*) at 2.5% were the only other species with more than 1% of the total shellfish weight. Together, these five taxa comprised over 98% of the total shellfish weight.

Table 4-2. Weight (in grams) and percent of shellfish components from Column 11/12.

	Depth below surface (cm)					
Shell Component	30-40	40-50	50-60	60-70	70-80	Total
BIVALVES:						
Clinocardium nuttalli	---	5.5	2.2	---	---	7.7
cockle		1.29%	0.39%			0.38%
Margaritifera margaritifera	---	4.1	---	---	---	4.1
freshwater mussel		0.73%				0.20%
Mytilus sp.	130.8	299.4	473.8	230.2	297.2	1431.4
mussels	70.02%	70.38%	84.08%	47.14%	85.72%	71.19%
Penitella penita	3.1	25.0	19.3	43.9	10.1	101.4
piddock	1.66%	5.88%	3.43%	8.99%	2.91%	5.04%
Protothaca staminea	0.1	0.2	0.2	0.1	---	0.6
littleneck clam	0.05%	0.05%	0.04%	0.02%		0.03%
Tresus sp.	---	1.1	---	---	---	1.1
gaper clams		0.26%				0.05%
UNIVALVES:						
Acmaeidae	---	0.3	0.3	---	---	0.6
limpets		0.07%	0.05%			0.03%
Amphissa columbiana	---	---	0.2	---	0.1	0.3
wrinkled amphissa			0.04%		0.03%	0.01%
Collisella digitalis	---	0.1	0.4	0.2	0.2	0.9
finger limpet		0.02%	0.07%	0.04%	0.06%	0.04%
Collisella pelta	---	0.5	0.2	0.4	0.9	2.0
shield limpet		0.12%	0.04%	0.08%	0.26%	0.10%
Nucella emarginata	---	0.8	0.2	---	0.6	1.6
rock dwelling purple		0.19%	0.04%		0.17%	0.08%
Nucella lamellosa	10.1	18.4	5.0	0.1	0.9	34.5
wrinkled purple	5.41%	4.33%	0.89%	0.02%	0.26%	1.72%
Nucella lima	---	0.1	0.1	---	---	0.2
rough purple		0.02%	0.02%			0.01%
OTHERS:						
Balanus sp.	40.0	56.8	39.7	192.2	31.6	360.3
barnacles	21.41%	13.35%	7.05%	39.36%	9.11%	17.92%
crab	---	---	---	0.1	---	0.1
				0.02%		0.00%
Katharina tunicata	1.1	3.1	7.1	2.1	---	13.4
black katy chiton	0.59%	0.73%	1.26%	0.43%		0.67%
Pollicipes polymerus	1.6	14.1	10.1	18.8	5.1	49.7
goose barnacle	0.86%	3.31%	1.79%	3.85%	1.47%	2.47%
Unidentifiable	---	---	0.6	0.2	---	0.8
			0.11%	0.04%		0.04%
TOTAL SHELLFISH	186.8	425.4	563.5	488.3	346.7	2010.7
	9.29%	21.16%	28.03%	24.29%	17.24%	

Table 4-3. Weight (in grams) of midden components in Column 39.

	Depth below surface (cm)								
Component	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	Total
Shellfish	5.5	217.8	307.3	528.1	183.9	79.3	81.3	16.9	1420.1
Bone	1.0	0.2	0.2	3.2	0.3	0.1	0.3	0.1	5.4
Cultural	---	---	0.9	0.1	---	0.1	0.1	---	1.2
Roots	0.1	0.1	---	---	---	---	---	---	0.2
Rock	253.1	5.0	9.6	22.3	40.4	2.7	4.5	0.7	338.3
Charcoal	0.9	0.7	1.9	1.8	0.2	0.4	0.4	0.4	6.7
Residue	579.5	986.4	910.5	906.4	858.5	621.0	864.4	863.0	6589.7
TOTAL	840.1	1210.2	1230.4	1461.9	1083.3	703.6	951.0	881.1	8361.6

Column 39

A column taken from Unit 39 sampled the shell deposit encountered along the route of the proposed new fence (Area A). This column sampled the landward side of the large shell deposit exposed on the north face of the headland previously examined in conjunction with the 1986 investigations. The results of the separation of this column into major midden constituents are presented in Table 4-3. The shellfish species represented in this column sample are listed by weight and percent in Table 4-4.

Twenty-one taxa were identified in Column 39. Mussel at 76.2%, cockle at 4.0%, and piddock at 7.0% accounted for most of the bivalves. Barnacle at 8.8% represented the second most commonly identified taxon. These groups comprised over 98% of the total shellfish weight.

Column 22

A column from Unit 22 sampled the sparse shell layer exposed along the periphery of the main shell midden (Area A). The results of the separation of this column into major midden constituents are presented in Table 4-5. The shellfish species represented in the column are listed by weight and percent in Table 4-6.

Only 10 taxa were represented in Column 22. Again, mussel at 89.8% was the most commonly identified taxon. Barnacle was the second most frequently encountered taxon at 7.2%. Piddock at 1.3% and gaper clam (*Tresus* sp.) at 1.15%, combined with mussel and barnacle, make up over 99% of the total shell weight in Column 22.

GRAB SAMPLE ANALYSIS

"Grab sampling" of molluscan species during the excavations, although not as rigorously controlled as the column samples, is more likely to ensure the reporting of molluscan species that are present at the site but missing by chance in the column samples. These samples also provided the whole valves of cockle (*Clinocardium nuttalli*) that were analyzed in order to determine the seasonality of site occupation.

During the unit excavations, all potentially identifiable shell other than sea mussel was collected from the screens. The molluscan remains recovered in this manner are identified in Table 4-7. Thirty-seven taxa were collected, 11 of which were not represented in the column samples. In contrast, lined red chiton (*Tonicella lineata)* and freshwater mussel (*Margaritifera margaritifera*) were the only species found in the column samples that were not also represented in the grab sample.

In Table 4-7 an attempt has been made to quantify the frequency of shellfish taxa by means of the number of levels in which they were found. It should be noted that gaper clam, although uncommon in the column samples, was well represented in the grab sample.

MOLLUSC AVAILABILITY

The intertidal area near Yaquina Head is composed of large basalt outcrops and boulders, with small basalt cobbles making up the beach area. This type of open coastal environment is ideal for sea mussel and horse barnacle, a situation that is strongly reflected in the midden analysis.

Mussel was the most commonly identified taxon represented at Yaquina Head. Mussels inhabit the middle intertidal zone and could have been collected at low tides throughout the year. Sea mussel is large, up to 25 cm in length, with a solid shell that could have been used for utensils (Barnett 1937:168). Bay mussel is smaller, up to 5 cm in length. As indicated by its name, bay mussel is usually found in protected bays. However, it can be found in protected waters on the outer coast. Sea mussel prefers the surf-swept shores of the outer coast that are more commonly found in vicinity of the headland. Both species of mussel attach themselves to rocks by means of byssal threads. The threads intertwine, making it easy to collect the mussels in mass rather than individually. When collecting mussels in this way, smaller species may be collected inadvertently, which may account for much of the variety of other species represented.

Table 4-4. Weight (in grams) and percent of shellfish components from Column 39.

	Depth below surface (cm)								
Component	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	Total
BIVALVES:									
Clinocardium nuttalli	---	0.7	21.9	0.2	30.1	3.1	0.6	---	56.6
cockle		0.32%	7.13%	0.04%	16.37%	3.91%	0.74%		3.99%
Hiatella gallicana	---	0.1	---	---	---	---	---	---	0.1
Gallic saxicave		0.05%							0.01%
Macoma nasuta	---	---	---	5.4	---	---	---	---	5.4
bent-nose clam				1.02%					0.38%
Mytilus sp.	3.4	175.0	216.0	400.9	139.8	70.5	63.9	12.7	1082.2
mussels	61.82%	80.35%	70.29%	75.91%	76.02%	88.90%	78.60%	75.15%	76.21%
Penitella penita	1.5	18.2	35.4	35.5	3.3	1.1	3.2	1.4	99.6
piddock	27.27%	8.36%	11.52%	6.72%	1.79%	1.39%	3.94%	8.28%	7.01%
Siliqua patula	---	---	0.2	---	---	---	---	---	0.2
razor clam			0.07%						0.01%
Tresus sp.	---	0.9	9.8	---	---	---	---	2.3	13.0
gaper clams		0.41%	3.19%					2.83%	0.92%
UNIVALVES:									
Acmaeidae	---	0.1	---	0.1	---	---	---	---	0.2
limpets		0.05%		0.02%					0.01%
Collisella digitalis	---	0.3	0.2	0.9	0.1	---	0.1	---	1.6
finger limpet		0.14%	0.07%	0.17%	0.05%		0.12%		0.11%
Collisella pelta	---	0.2	0.1	0.2	---	---	---	---	0.5
shield limpet		0.09%	0.03%	0.04%					0.04%
Nucella emarginata	---	0.8	0.2	0.6	---	---	---	---	1.6
rock dwelling purple		0.37%	0.07%	0.11%					0.11%
Nucella lamellosa	0.3	0.7	0.6	---	---	---	---	---	1.6
wrinkled purple	5.45%	0.32%	0.20%						0.11%
Nucella lima	---	0.5	0.1	0.2	0.1	---	0.1	---	1.0
rough purple		0.23%	0.03%	0.04%	0.05%		0.12%		0.07%
Selenites sp.	---	---	---	---	0.6	0.3	0.1	---	1.0
selens					0.33%	0.38%	0.12%		0.07%
OTHERS:									
Balanus sp.	---	14.7	19.1	75.5	7.3	3.2	4.6	0.9	125.3
barnacles		6.75%	6.22%	14.30%	3.97%	4.04%	5.66%	5.33%	8.82%
Balanus balanus	0.2	0.1	---	---	---	---	1.9	---	2.2
sharp acorn barnacle	3.64%	0.05%					2.34%		0.15%
crab	---	---	---	0.1	---	---	---	---	0.1
				0.02%					0.01%
Cryptochiton stelleri	---	---	0.1	---	---	---	---	---	0.1
gumboot chiton			0.03%						0.01%

Table 4-4 (continued)

	Depth below surface (cm)								
Component	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	Total
Katharina tunicata black katy chiton	---	0.3 0.14%	1.0 0.33%	0.5 0.09%	1.9 1.03%	0.5 0.63%	3.2 3.94%	1.0 5.92%	8.4 0.59%
Pollicipes polymerus goose barnacle	0.1 1.82%	3.7 1.70%	2.6 0.85%	3.3 0.62%	0.4 0.22%	0.5 0.63%	0.8 0.98%	0.1 0.59%	11.5 0.81%
Tonicella lineata lined red chiton	---	---	---	0.2 0.04%	---	---	---	---	0.2 0.01%
Unidentifiable	---	1.5 0.69%	---	4.5 0.85%	0.3 0.16%	0.1 0.13%	0.5 0.62%	0.8 4.73%	7.7 0.54%
TOTAL SHELLFISH	5.5 3.87%	217.8 15.34%	307.3 21.64%	528.1 37.19%	183.9 12.95%	79.3 5.58%	81.3 5.72%	16.9 1.19%	1420.1

Barnacle, the second most frequent taxon, is normally found in a lower intertidal zone than sea mussel, but it often overlaps into the mussel's range. Horse barnacle does not have a calcareous base and would therefore be difficult to collect off the rocks without damaging the meat. If it was gathered as a hitchhiker with mussel, however, it could have been procured without damage. Giant barnacle (*B. nubilus*) and sharp acorn barnacle (*B. balanus*) inhabit the rocky outer coast in the lowermost intertidal zones. These barnacles could only be collected during very low tides, which may account for their scarcity.

Piddock can bore into rock that is extremely hard (Ricketts and Calvin 1968:274). Although it is difficult to collect, it is the most frequently encountered bivalve after mussel. Piddock inhabits the lower-middle intertidal zones and could be collected during medium low tides.

Goose barnacle was found on a regular basis. Since goose barnacle inhabits the middle intertidal zones, it would have been easily accessible throughout the year. Native coastal peoples sometimes built fires over barnacles, roasted them in place on the rocks, and consumed them on the spot (Harrington 1943; Greengo 1952:72). If this was a common practice, it would result in an underestimation of the extent to which goose barnacle was used as food.

Littleneck clam (*Protothaca staminea*), butter clam (*Saxidomus giganteus*), cockle, macomas (*Macoma* sp.), razor clam (*Siliqua patula*), and gaper clam were identified. Cockle was identified on a more regular basis then the other species. Cockle can be found near the surface sand or mud in protected waters or on the surface of eelgrass flats. These clams, with the exception of razor clam, prefer the calm waters of bays and estuaries, but can also be found on the protected outer coast. Although littleneck clam and macomas were scarce in the midden, they could have been collected throughout the year during medium-low tides.

Butter clam occurs somewhat lower in the intertidal zone but overlaps enough with littleneck so that they can often be collected together. Horse clam is found low in the intertidal zone and is deeply buried. Razor clam could be found on surf-swept sand beaches. Reports to the Oregon Department of Fish and Wildlife on collections made by biology classes at Yaquina Head list all of these species except gaper clams and razor clams (Oregon Department of Fish and Wildlife 1987). The quantities found in the midden are limited. Because they have stout, bowl-shaped shells, horse clam, butter clam, littleneck clam, and cockle may also have been collected for use as spoons, ladles, and containers (Barnett 1937:168).

Four species of chiton were identified. Black katy chiton (*Katharina tunicata*) was found on a regular basis. It inhabits the lower-middle intertidal zone and can occasionally be found with sea mussel. It attains an edible size and was probably used as food. It does not retreat to shady areas during the daylight hours as most other chitons do, making it easy prey (Wesson 1982). Gumboot chiton (*Cryptochiton stelleri*) was also found, but not as commonly as black katy chiton. It is large and inhabits the lower intertidal zone, making it difficult to procure. Mossy chiton (*Mopalia muscosa*) and lined red chiton were rarer. They inhabit the same zone as sea mussel and are small in size. Unlike the other two chitons, it is doubtful the mossy chiton and red-lined chiton were used as food.

Numerous univalve taxa were found, although most of them are very small. They inhabit the same or overlapping intertidal areas with sea

Table 4-5. Weight (in grams) of midden components in Column 22.

	Depth below surface (cm)			
Component	90-100	100-110	110-120	Total
Shellfish	355.4	509.3	13.0	877.7
Bone	0.3	---	6.8	7.1
Cultural	---	---	---	0.0
Roots	0.1	---	---	0.1
Rock	17.0	17.6	2.3	36.9
Charcoal	0.7	0.7	0.2	1.6
Residue	718.7	865.0	734.0	2317.7
TOTAL	1092.2	1399.4	749.5	3241.1

Table 4-6. Weight (in grams) and percent of shellfish components in Column 22.

	Depth Below Surface (cm)			
Shell Component	90-100	100-110	110-120	Total
BIVALVES:				
Clinocardium nuttalli cockle	0.7 0.20%	---	---	0.7 0.08%
Mytilus sp. mussels	332.1 93.44%	444.6 87.30%	11.8	788.5 89.84%
Penitella penita piddock	4.2 1.18%	6.7 1.32%	0.7 5.38%	11.6 1.32%
Tresus sp. gaper clams	---	9.2 2.01%	---	9.2 1.05%
UNIVALVES:				
Collisella digitalis finger limpet	0.1 0.03%	0.1 0.02%	---	0.2 0.02%
Nucella emarginata rock dwelling purple 0.08%	0.7 0.20%	---	---	0.7
Nucella lima rough purple	---	0.1 0.19%	---	0.1 0.01%
OTHERS:				
Balanus sp. barnacles	14.5 4.08%	48.0 9.42%	0.5 3.85%	63.0 7.18%
Katharina tunicata black katy chiton	0.9 0.25%	---	---	0.9 0.10%
Pollicipes polymerus goose barnacle	0.6 0.17%	0.5 0.11%	---	1.1 0.13%
Unidentifiable	1.6 0.45%	0.1 0.19%	---	1.7 0.19%
TOTAL SHELLFISH	355.4 40.49%	509.3 58.03%	13.0 1.48%	877.7

Table 4-7. Shellfish represented in grab samples.

	Area A/Stratum			Area B/Stratum			Auger	Number of Unit/Levels
Species	1	2	3	1	2	3	Holes	Represented
BIVALVES:								
Clinocardium nuttalli	-	14	-	1	16	1	1	33
Hiatella gallicana	-	1	-	-	2	-	-	3
H. pholadis	-	1	-	-	-	-	-	1
Macoma sp.	-	1	-	-	-	-	-	1
Macoma nasuta	-	3	-	-	-	-	-	3
Mytilus sp.	-	4	-	-	4	-	-	8
M. californianus	-	17	-	2	24	2	-	45
Penitella penita	1	25	-	-	22	-	-	48
Protothaca staminea	-	2	-	-	4	-	-	6
Saxidomus giganteus	-	3	-	-	1	-	-	4
Siliqua patula	-	1	-	-	-	-	-	1
Tresus sp.	-	18	-	-	3	1	-	22
UNIVALVES:								
Acmaeidae	-	20	-	1	32	-	-	53
Acmaea mitra	-	4	-	-	1	-	-	5
Amphissa columbiana	-	1	-	-	-	-	-	1
Calliostoma ligatum	-	2	-	-	-	-	-	2
Collisella digitalis	-	20	-	-	13	-	2	35
C. pelta	-	31	-	2	36	1	2	72
C. persona	-	20	-	-	10	-	-	30
Diodora aspera	-	1	-	-	1	-	-	2
Flumicola nuttalliana	-	-	-	-	1	-	-	1
Notoacmaea scutum	-	-	-	-	1	-	-	1
Nucella emarginata	-	40	-	1	51	-	-	92
N. lamellosa	-	13	-	-	28	2	1	44
N. lima	1	41	-	-	39	1	4	86
Olivella biplicata	-	3	-	-	2	-	-	5
Polygyra townsendiana	-	2	-	-	-	-	-	2
Searlesia dira	-	2	-	-	-	-	-	2
Selenites sp.	-	18	-	-	11	-	-	29
OTHERS:								
Balanus sp.	-	2	-	-	1	-	-	3
B. balanus	-	-	-	-	6	-	-	6
B. cariosus	-	6	-	-	14	-	-	20
B. nubilus	-	1	-	-	-	-	-	1
Cancer sp.	-	2	-	-	2	-	-	4
Cryptochiton stelleri	-	3	-	-	8	-	1	12
Katharina tunicata	1	56	-	1	48	2	-	108
Mopalia muscosa	-	4	-	-	1	-	-	5
Pollicipes polymerus	-	7	-	-	17	-	-	24

mussel and may have been collected inadvertently with the mussel. The exceptions are wrinkled purple (*Nucella lamellosa*), keyhole limpet (*Diodora aspera*), and olivella (*Olivella biplicata*). Wrinkled purple and keyhole limpet attain an edible size and were probably used as food. Keyhole limpets are found only during the lowest tides, which probably accounts for their relative scarcity. Wrinkled purple is a nocturnal predator that clusters in shaded areas during the daylight hours. It also congregates during its mid-winter breeding season at low tide level. These daily and seasonal concentrations would have made collecting relatively easy (Wesson 1982). Olivella was identified in five samples. It inhabits protected sandy beaches and would be found individually rather than clinging to other molluscs. The use of olivella for beads is widely noted in the ethnographic literature for the Oregon coast (Barnett 1937:174).

The crab fragments are probably *Cancer* sp., but the extremely small fragments could not be identified with any degree of certainty. A number of crab species have been identified in the area, including *Cancer oregonensis*, *C. productus*, *C. antennarius*, *Hemigrapus oregonensis*, *H. nudus*, and *Oedignathus* sp. (Oregon Department of Fish and Wildlife 1987). The low incidence of crab suggests it was not used as a major food source.

In addition to the marine shellfish, two species of land-dwelling snails were identified. Townsend's snail (*Polygyra townsendiana*) and a type of Selen (*Selenites* sp.) were found in the midden. Because these snails occur naturally within the area, their use for subsistence purposes is problematical. A freshwater inhabitant of streams and springs, Nuttall's flood snail (*Flumicola nuttalliana*) and freshwater mussel were also identified. The small size of this snail suggests that it was not a source of food. It was probably a hitchhiker to the site on grass or stones collected in nearby streams. However, freshwater mussel reaches an edible size and was likely used whenever it was found, although it was probably not actively sought after.

GROWTH RING ANALYSIS

An estimate of the season during which 35LNC62 was occupied can be obtained from the shellfish recovered. Analysis of the growth rings on shellfish has been shown to be a reliable means of inferring the season of occupation at archaeological sites (Ham and Irvine 1975; Ham 1976; Keen 1979). In bivalves, shell growth occurs on the ventral edge of the shell when the valves are open collecting food. A growth ring or layer is defined as two surfaces that vary in color from the previous growth layer as a result of a change in the rate of deposition of calcium carbonate. The deposition rate of calcium carbonate is influenced by physical or chemical changes in the environment (Wilbur 1964). Variation in growth rings found in marine molluscs is explained as the result of changes in food supply and water temperatures over the course of the year. A light wide ring develops during the spring and summer when shell growth is greatest, while a dark thin ring is formed in the winter when growth rates decline (Ham and Irvine 1975; Keen 1979).

Ham and Irvine (1975) discuss four techniques for studying growth rings, one of which has been used here. This technique involved sawing a valve in half lengthwise and polishing the transverse section. A solution of methylene blue was then applied to the polished section. The solution was more readily absorbed by the light-colored, less dense summer growth rings, making them stand out from the darker winter check rings. A Swift binocular microscope (7-30x) was used to help distinguish the winter check rings from the spring and summer growth. By checking the growth rings on the surface of the transverse section, using the most recent winter check ring and subsequent growth, the approximate season of death can be estimated.

Thirty-two valves were initially selected from the grab sample for the seasonality study. These consisted of the whole or nearly whole valves of cockle, butter clam, gaper clam, and macomas. Of the 32 valves, 13 were discarded due to disturbances in the growth ring pattern, leaving only cockle for interpretation. Table 4-8 lists the results and interpretations of the season of death for the selected valves. The season of death was inferred using the percentage of growth of the valve's most recent annual growth band as compared to the previous growth band. Several different interpretations of the percentages and their relationship to the season of death have been suggested (Ham and Irvine 1975; Keen 1979; Wesson 1982; Hurst 1986). Wesson (1982) interprets the percentages in this way:

0-40% = late winter to early spring
40-70% - late spring and summer
70-85% - fall
85-100% - early winter

Wesson's interpretation is used here because it is somewhat more generalized and is probably more appropriate for the small sample size of the present study. As Table 4-8 indicates, 95% of the valves were interpreted as having a late winter to early spring season of death.

It should be noted that the cockles used for the seasonality study are a protected water species and are very minor constituents of the midden. The possibility that these shells were collected for use as utensils at another site, and subsequently carried to Yaquina Head, should be considered. The possibility also exists that the collecting of shellfish, especially the clams, was emphasized in late winter and early spring because other resources were in low supply or merely for a change of diet.

Data presented in Chapter 5 of this volume suggest that some resources may have been obtained at Yaquina Bay in the late winter/early spring and brought back to the headland. The cockles, which

Table 4-8. Seasonal interpretation from growth ring analysis on cockle (*Clinocardium nuttalli*) recovered from Yaquina Head.

			Inferred Season*			
Unit	Level	Growth	W	W/S	S/S	F
AREA A:						
43	1	41%			X	
23	7	10%		X		
39	7	31%		X		
32	8	0%		X		
42	8	4%		X		
24	8	0%		X		
39	11	t		X		
42	11	t		X		
42	12	0%		X		
36	13	0%		X		
36	13	31%		X		
39	13	11%		X		
39	13	0%		X		
AREA B:						
9	5	8%		X		
14	7	0%		X		
14	7	0%		X		
14	7	0%		X		
13	7	13%		X		
12	7	6%		X		

t - trace of growth

* Inferred Season: W/S - late winter/early spring (0-40%)
S/S - late spring/summer (40-70%)
F - fall (70-85%)
W - early winter (85-100%)

occur more commonly in the protected environment of Yaquina Bay than in the exposed coastline of Yaquina Head, may be interpreted as a further indication of late winter/early spring utilization of the bay's resources.

CONCLUSIONS

Mussel was the dominant marine shellfish species exploited at Yaquina Head, accounting for approximately 77% of the identifiable remains by weight. Although they were found consistently throughout the midden, barnacle, piddock, goose barnacle, and black katy chiton were less intensively used. Cockle, horse clam, littleneck clam, and butter clam were also present, but to a much lesser extent. Given the rocky outer coast environment near the site, the presence of mussel, piddock, chiton, and barnacles is to be expected. The less frequently encountered clam and cockle species were probably available in quantity only at protected beaches at some distance from the site.

It appears, then, that the native inhabitants of Yaquina Head relied heavily on the readily available outer coast shellfish species close to the site. The seasonality data strongly suggest a late winter to early spring occupation although, as noted above, the possibility exists that the shells used for the seasonality assessment were transported from a locality elsewhere along the coast.

CHAPTER 5

VERTEBRATE FAUNAL REMAINS

by Ruth L. Greenspan and Rebecca J. Wigen

The vertebrate faunal remains recovered from the 1989 excavations at Yaquina Head were identified using comparative osteological collections at the Condon Museum of Geology and the Oregon Institute of Marine Biology, University of Oregon, and the Department of Anthropology, University of Victoria. All recovered specimens were included in the analysis, and all were identified to the lowest possible taxonomic level. The fish and mammals were identified by Ruth L. Greenspan, assisted by Scott T. Dano, both of Heritage Research Associates, Inc. and the birds were identified by Rebecca J. Wigen, of Pacific Identifications, Victoria, B.C.

A total of 12,041 vertebrate faunal specimens was recovered during the 1989 excavations. This total includes at least 16 species of mammals, 18 species of fish, and 24 species of birds. Table 5-1 is an inventory of the taxa identified during the analysis of the 1989 assemblage from 35LNC62. The main excavation data are presented by area and stratum, and the auger hole and column sample data are presented separately.

In both Area A and Area B considerably more bone was recovered from the shell stratum, Stratum 2, than from either the stratum above the shell (Stratum 1) or the stratum below the shell (Stratum 3). Table 5-2 shows the total amount of bone recovered per cubic meter from each stratum in both areas.

TAXONOMIC ACCOUNTS

Class AVES

Unless otherwise noted, the accounts below are summarized from information presented in Gabrielson and Jewett (1970), Peterson (1961), and Robbins, Bruun and Zim (1966). References to the modern abundance of a given species in the Yaquina Head area are from the Bureau of Land Management (1983:14).

Table 5-1. Inventory of faunal remains for 1989 excavations at 35LNC62.

	Area A			Area B			Area C		Auger	Column	
Taxon/Stratum	1	2	3	1	2	3	1	3	Holes	Samples	TOTAL
TERRESTRIAL MAMMALS:											
Leporid		1									1
Beaver					1						1
Voles		2									2
Rodents		3			1						4
Shrews		1									1
Moles		1									1
Raccoon		1			1						2
Bobcat		1			6						7
Carnivores		1		1	3						5
Deer	5	50	1	2	10				1		69
Elk	2	15	1		14	1				1	64
Cervid				1							1
Artiodactyls	2	6	1	2	12	4					27
MARINE MAMMALS:											
Harbor seal	1	1	1	1	13						17
Steller sea lion		1	1	1	8						11
California sea lion		1									1
Northern fur seal					2						2
Otariids	3	8			17						28
Pinnipeds	2	14	1	3	36	1			1		58
Dolphins		1			2						3
Whales		2	5		2						9
Cetaceans	34	356	7	48	577	4			45		1071
Sea otter	3	8		3	17						31
Unidentifiable mammals	168	747	104	77	600	22	41	1	126	5	1891
FISH											
Skate, cf. big skate					16						16
Ratfish					1						1
Pacific herring		191			42	1				3	237
Salmonids				2	27						29
Pacific hake	9	299	5	10	566	3			12	2	906
Pacific tomcod		189			9					34	232
Gadids										1	1
Striped surfperch				1	1						2
Surfperch, cf. redtail		1									1
Surfperches		11		4	19						34
Pricklebacks		2			2						4
Rockfishes	1	30		2	13				1		47
Greenlings	4	110	1	22	224				1	5	367
Lingcod	1	35		4	42				6		88
Buffalo sculpin		259		2	9				2	7	279
Pacific staghorn sculpin		5									5
Sculpin, cf. red Irish lord		2			10						12
Cabezon		6			9						15
Sculpins		14		2	26	1				8	51
Starry flounder				1	1						2
Flatfish		10			7						17
Unidentifiable fish	19	1474	8	139	1214	6			46	20	2926

Table 5-1 (continued)

	Area A			Area B			Area C				
Taxon/Stratum	1	2	3	1	2	3	1	3	Auger Holes	Column Samples	TOTAL
BIRDS:											
Common loon	1	7		1	4						13
Loon, cf. Pacific loon		2									2
Loon, small				2	6						8
Western grebe		2									2
Grebe, cf. red-necked grebe		1									1
Horned grebe					2						2
Grebe, large		4		1							5
Grebe, small					1						1
Albatross	1	46	1	5	39						92
Pacific fulmar		6		16	133						155
Shearwaters		3		1	32						36
Shearwater, cf. slender-billed shearwater	1										1
Storm petrel		2			11						13
Procellarids					2						2
Cormorant, large	2	15			3						20
Cormorant, medium	1	11	1	6	48						67
Cormorant, small		3			3						6
Goose, small			1								1
Mallard?					1						1
White-winged scoter	2	26	1	1	20						50
Surf scoter	1	3			1						5
Scoter, large				1	1						2
Scoter, medium		2			1						3
Goldeneye, large					2						2
Bufflehead		1									1
Diving duck, large						3					3
Diving duck, medium	2	9			1						12
Duck, large		2	16	2	2	9					31
Duck, medium	2	20	2	5	12						41
Duck, small	1	1	1		2						5
Ruffed grouse	1										1
Shorebird, large		2			4	1					7
Gull, large	2	15			7						24
Gull, medium		2			1						3
Gull, small					7						7
Common murre		25			9						33
Marbled murrelet		9									9
Rhinoceros auklet					11						11
Cassin's auklet					1						1
Alcid, cf. tufted puffin					19						19
Alcid, medium		5			4						9
Alcid, small		1		2	2						5
Songbird, medium					3						3
Songbird, small					1						1
Unidentifiable birds	31	300	10	67	584	4			11	11	1018
UNIDENTIFIABLE BONE FRAGMENTS	22	438	29	112	1037	3			76	41	1758
TOTAL	326	4831	184	552	5589	51	41	1	328	138	12,041

Table 5-2. Distribution of bone per cubic meter by area and stratum.

	Area A/Stratum			Area B/Stratum		
	1	2	3	1	2	3
Cubic meters excavated	28.1	3.8	9.6	9.0	3.3	2.4
Unmodified bone (N)	326	4831	184	552	5589	51
Bone/cubic meter	11.6	1284.8	19.2	61.2	1693.6	21.3

Order GAVIIFORMES
Family GAVIIDAE

The loons are powerful divers that feed on fish and other aquatic animals, and come ashore only to breed and nest. There are three species of loon that occur in Oregon, and all of them use the Yaquina Head area. The assemblage from the 1989 excavations at 35LNC62 resulted in the recovery of several specimens identified as common loon, a few specimens tentatively identified as Pacific loon, and some specimens identified as "small loon," which represent either Pacific loon or red-throated loon.

Gavia immer - Common Loon

The common loon has been observed in coastal Lincoln County during every month of the year, although it is best known on the Oregon coast as a fall migrant and winter resident. On the Oregon coast the common loon occurs most abundantly on saltwater bays and inlets, although it may be found on large lakes and streams, as well. It is likely that some common loons breed in coastal lakes . This species has been recorded as a common user of the Yaquina Head area during periods of migration and wintering.

Gavia pacifica - Pacific Loon

The Pacific loon is a winter resident on the Oregon coast, where it is found on bays and in the ocean. It was apparently more common in Oregon in the past than it is today. This species has been recorded as an uncommon winter resident in the Yaquina Head area.

Order PODICIPEDIFORMES
Family PODICIPEDIDAE - Grebes

Podiceps grisegena - Red-necked Grebe

Although the red-necked grebe is a fairly common winter resident along parts of the Oregon coast, it has been described only as an uncommon user of the Yaquina Head area. Its favored habitats are rivers and saltwater bays.

Podiceps auritus - Horned Grebe

Like the red-necked grebe, the horned grebe is a winter resident of the Oregon coasts. Its preferred habitats are saltwater bays and inlets, where it has been reported to be the most abundant of the wintering grebes. It occurs less commonly on larger rivers in western Oregon. The horned grebe may be found along the Oregon coast from September to May. It is reported to be a common user of the Yaquina Head area.

Aechmophorus occidentalis - Western Grebe

The western grebe is an extremely common winter resident of the Oregon coast, where its preferred habitats are bays and large rivers; it also occurs on the open ocean beyond the breakers. Like the horned grebe, it is present on the Oregon coast from September to May. Its abundance in the Yaquina Head area has been reported as numerous.

Order PROCELLARIIFORMES
Family DIOMEDEIDAE - Albatrosses

The albatrosses are large seabirds of the open ocean. Their enormous wings are used primarily for gliding flight, and they come ashore only to breed. Albatrosses are primarily birds of the southern hemisphere, and only three species breed north of the equator. The black-footed (*Diomedea nigripes*) and Laysan (*D. immutabillis*) albatrosses breed in the central Pacific; the short-tailed albatross (*D. albatrus*), which is nearly extinct, breeds in the western Pacific. All three of these species have been reported off the Oregon coast, primarily during the summer months.

The black-footed albatross is the most common species in Oregon waters at the present time. However, reports from the nineteenth century, as well as archaeological data, suggest that the short-tailed albatross was formerly quite abundant in the eastern North Pacific, and may well have been the most abundant albatross in that region (Yesner 1976). Early reports of albatross sightings also suggest that the short-tailed albatross, while by no means an inshore bird, probably occupied a more inshore niche than the other two species (Miller 1940: 231). No comparative material of short-tailed albatross was available at the time of this study, and thus it was not possible to make a positive identification of the albatross remains recovered from 35LNC62. However, the Yaquina Head material was consistently and significantly larger than comparative specimens of black-footed albatross, suggesting that it represents the larger short-tailed albatross. The short-tailed albatross was sighted off the Oregon coast in the nineteenth and early twentieth centuries, and specimens identified as this species have been found in shell mounds in coastal Tillamook and Lincoln Counties (Gabrielson and Jewett 1970:81).

Family PROCELLARIIDAE - Shearwaters and Fulmars

Fulmarus glacialis

The Pacific fulmar, like its larger albatross relatives, is a strong flier that occupies an open ocean habitat. Although it does not commonly come near land except during breeding season, it is more likely to be seen near shore than the albatrosses. In the Pacific Northwest the fulmar breeds on islands in the Bering Sea, the Aleutians, and the Alaska Peninsula, and winters offshore from the Bering Sea to central California. It is a common and regular winter resident off the coast of Oregon, generally arriving there in September and leaving by the first of March. Fulmar remains are more strongly represented in the 1989 Yaquina Head assemblage than any other species of bird, comprising 21% of the identifiable bird remains.

Puffinus sp. - Shearwaters

Like the other Procellariiformes, the shearwaters are birds of the open sea. They generally remain some distance offshore, except when breeding, although shearwaters are more likely than either the albatrosses or the fulmars to range into inshore waters during storms or when following schools of fish (Bent 1964:88; Gabrielson and Jewett 1970:82-83). There are five species of shearwaters that occur off the Oregon coast: *Puffinus griseus* (sooty shearwater), *P. creatopus* (pink-footed shearwater), *P. tenuirostris* (slender-billed shearwater), *P. bulleri* (New Zealand shearwater), and *P. carneipes* (pale-footed shearwater). These birds all breed in the southern hemisphere and occur in Oregon waters primarily in our summertime, where they feed on fish, squid, crustaceans, and garbage thrown off ships.

The bulk of the shearwater remains recovered from the 1989 Yaquina Head excavations was not identifiable to species; a single specimen was tentatively identified as slender-billed shearwater. The most common and abundant shearwater found off the Oregon coast today is the sooty shearwater.

Family HYDROBATIDAE - Storm Petrels

Storm petrels are small birds that live over the open sea, except when breeding. They nest on offshore islands. They are nocturnal while on land, and their habits are not very well known. There are two species of storm petrel that occur in Oregon: Leach's petrel (*Oceanodroma leucorhoa*) and the less common fork-tailed petrel (*O. furcata*). Both of them breed on Three Arch Rocks near Tillamook; Leach's petrels also breed on Island Rock off Port Orford and on rocks near Brookings (Gabrielson and Jewett 1970:86-89). Both Leach's and fork-tailed petrels breed on Haystack Rock at Pacific City, and there have been unconfirmed reports of storm petrels breeding near Heceta Head (Roy Lowe, personal communication, December 1990). Both species may breed on other offshore rocks in the region as well.

Order PELECANIFORMES

Family PHALACROCORACIDAE - Cormorants

Cormorants are relatively large, diving water birds that are very common and abundant along the Pacific Northwest Coast. There are three species that occur in Oregon: double-crested cormorant (*Phalacrocorax auritus*), Brandt's cormorant (*P. penicillatus*), and pelagic cormorant (*P. pelagicus*). All three of these species winter and breed along the coast, and the double-crested cormorant is found inland as well, on some of the larger lakes of eastern Oregon. Cormorants feed on fish and crustaceans, and are never found far from open bodies of water. Cormorants are colonial breeders, and along the coast their preferred nesting sites are offshore rocks or rocky headlands.

It was not possible to make species determinations on the cormorant bones from the Yaquina Head assemblage with the available comparative material. However, the cormorant remains did sort into three different size groups, and it may well be that all three species are present in the assemblage. The bulk of the cormorant remains were in the middle size category, which, along with the largest specimens, could represent either Brandt's or double-crested cormorants. The double-crested cormorant tends to be slightly larger than the Brandt's. Those specimens that are identified as "small cormorants" are probably pelagic cormorants, which are notably smaller than the other two species. All three species use the Yaquina Head area during periods of migration and wintering, and the Brandt's and pelagic cormorants also breed there (Bureau of Land Management 1983:14).

Order ANSERIFORMES
Family ANATIDAE - Ducks, Geese, and Swans
Subfamily ANSERINAE - Geese

Geese are large, migratory waterfowl that are strongly social and generally migrate in large flocks. Although no species of geese breed on the Oregon coast, at least five species are migrants through or winter residents of the region: Canada goose (*Branta canadensis*), black brant (*B. nigricans*), American brant (*B. bernicula*), snow goose (*Chen caerulescens*), and white-fronted goose (*Anser albifrons*). The Canada goose includes at least ten recognized races or subspecies, at least four of which occur in western Oregon.

Geese are not common in the Yaquina Head area; they do not breed or winter there currently. However, reports filed with the U.S. Department of Agriculture's Biological Survey between 1884 and 1923 indicate that geese (species not noted) were regularly, if not commonly, observed at Yaquina Head in the spring and early fall, during their annual migrations (Bayer 1986). The black brant is reported to winter at Yaquina Bay (U.S. Fish and Wildlife Service 1968:12).

Subfamily ANATINAE - Surface-feeding Ducks

Surface-feeding or dabbling ducks characteristically occupy the shallow waters of creeks, ponds, and fresh- or salt-water marshes. They feed by dabbling and tipping-up in shallow water; they also feed on land, grubbing in mud or occasionally grazing. Their diet consists largely of plant foods, including aquatic plants, grasses, and seeds; they also eat insects, snails, small crustaceans, earthworms, and small fish.

It was not possible to identify all of the Yaquina Head ducks to species, but an attempt was made to distinguish between diving ducks and dabbling, or surface-feeding ducks. Only one specimen was identified as a surface-feeding duck, and it was tentatively identified as mallard (*Anas platyrhynchos*). The mallard is a highly adaptable permanent resident throughout Oregon, and may be found wherever water is present. The lack of other surface-feeding ducks in the assemblage is not surprising, as the habitats they favor are not present near the headland, and they are not included in the list of birds that use the Yaquina Head area today.

Subfamily AYTHYINAE - Diving Ducks

The subfamily Aythyinae includes both sea ducks and bay ducks. The sea ducks occur primarily in coastal regions, and are rarely found inland, while the bay ducks commonly winter on lakes and rivers, as well as protected coastal bays and river mouths. As their name implies, diving ducks dive for their food, which consists primarily of small molluscs and crustaceans. At least four species of diving ducks were present in the 1989 assemblage from 35LNC62: white-winged scoter (*Melanitta deglandi*), surf scoter (*M. perspicillata*), bufflehead (*Bucephala albeola*), and a large goldeneye, either common goldeneye (*Bucephela clangula*), or Barrow's goldeneye (*B. islandica*). None of these species breeds at Yaquina Head; the white-winged scoter and the surf scoter are very abundant users of the Yaquina Head area during periods of migration and wintering. The only other diving ducks that are recorded as users of the Yaquina Head area are the black, or common scoter (*Oidemia nigra*), and the harlequin duck (*Histrionicus histrionicus*).

Bucephala clangula - Common Goldeneye

The common, or American goldeneye is a common winter resident on coastal bays and lakes, and on large rivers throughout Oregon. It breeds in the interior of Canada and the northern United States. It arrives in Oregon later than most ducks; the earliest date of arrival is mid- November. It begins leaving by March, and is gone from the state by mid-May. The common goldeneye is an excellent diver, and feeds on crustaceans, molluscs, insects, and other aquatic animals; it occasionally feeds on plants as well.

Bucephala islandica - Barrow's Goldeneye

The Barrow's goldeneye has been recorded only rarely on the Oregon coast, although it is so similar in appearance to the common goldeneye that it is likely that it has often been misidentified and is more common on the coast than the records indicate (Gabrielson and Jewett 1970:162-3). In Oregon it breeds and summers in the higher Cascade lakes, and little is known of its winter distribution. Its feeding habits are probably similar to those of the common goldeneye.

Bucephala albeola - Bufflehead

The bufflehead is a small duck that winters widely throughout the state wherever there is open water. The bufflehead was formerly a very abundant migrant and winter resident along the Oregon coast, although its numbers have been considerably reduced since the 1930s. It is present on the coast from mid-October until mid-April. Its feeding habits are similar to those of the larger goldeneyes.

Melanitta fusca - White-winged Scoter

The white-winged scoter, or sea coot, is a large, clumsy sea bird that is found throughout the year on the Oregon coast. It is present there most abundantly in the winter, but is fairly common in the summer as well. It occurs on the ocean, and also on bays and large freshwater coastal lakes. The white-winged scoter feeds primarily on molluscs, and has been known to eat shellfish of considerable size. It is very abundant in the Yaquina Head area during the winter.

Melanitta perspicillata - Surf Scoter

The surf scoter is a very common sea duck that is found on the Oregon coast throughout the year. As its name implies, it is found on the ocean surf, often just outside the breakers; it is also found on bays and coastal lakes. Its abundance in Oregon waters is highest from August through May; in June and July, breeding individuals migrate north and only nonbreeding birds remain in Oregon. Like the white-winged scoter, the surf scoter is very abundant in the Yaquina Head area during the winter.

Order GALLIFORMES
Family TETRAONIDAE - Grouse

Bonasa umbellus - Ruffed Grouse

The ruffed grouse is a permanent resident of western Oregon, and occurs in the northeastern portion of the state as well. It is a ground-dwelling bird that occupies mixed or deciduous woodland habitats. In western Oregon it is a fairly common resident of alder and willow bottoms.

Order CHARADRIIFORMES
Family LARIDAE - Gulls and Terns

The family Laridae consists of two subfamilies: the Larinae, or gulls, and the Sterninae, or terns. The gulls are more robust and wider-winged than the streamlined, more maneuverable terns. The gulls swim, but seldom dive; the terns hover and plunge head first into the water, but they do not generally swim. The terns feed on small fish and aquatic insects, while the omnivorous gulls are primarily scavengers.

Larus - Gulls

All of the specimens from the 1989 Yaquina Head assemblage that were identified as Laridae belong to the genus *Larus*; none of them could be identified to species. The specimens covered a range of sizes, and it is probable that several species of gull are represented in the assemblage. Several species of *Larus* use the Yaquina Head area during periods of migration and wintering: glaucous-winged gull (*Larus glaucescens*); western gull (*L. occidentalis*); herring gull (*L. argentatus*); Bonaparte's gull (*L. philadelphia*); and Heermann's gull (*L. heermanni*). In addition, there are two gulls of other genera using the Yaquina Head area: black-legged kittiwake (*Rissa tridactyla*), and Sabine's gull (*Xema sabini*). The western gull and the glaucous-winged gull also breed at Yaquina Head.

Family ALCIDAE - Alcids

The alcids are black and white seabirds that are somewhat reminiscent of penguins, both in appearance and in habits. They are excellent underwater swimmers and divers, using their small, narrow wings for propulsion, and their webbed feet as rudders. Alcids are pelagic birds that come ashore only to breed.

Uria aalge - Common Murre

The common murre is an extremely abundant breeding and resident seabird on the Oregon coast. It breeds on high offshore rocks and on rocky headlands, generally in early June. By August the young take to the water, and common murres can be found in nearshore and offshore Oregon waters, including large bays and the open ocean, throughout the year. Common murres feed on small fish, swimming crustaceans, and occasionally worms and other bottom-dwelling invertebrates. Large numbers of common murres breed and winter at Yaquina Head.

Brachyramphus marmoratus - Marbled Murrelet

The marbled murrelet is a regular summer and winter resident of the Oregon coast, and is generally found in the mouths of bays and in nearshore ocean habitats. Unlike other alcids, marbled murrelets do not feed in large flocks; during the breeding season they feed singly or in pairs, and in the wintertime they may form loose aggregations. Little is known about the food preferences of the marbled murrelet, but like other alcids, it appears to feed on small fish and crustacea. In large part, data regarding this bird's nesting habitat and behavior have been elusive. It is now known that in the Pacific Northwest the marbled murrelet nests inland, in old growth and possibly mature forests (Marshall 1988). The marbled murrelet is an occasional winter resident of the Yaquina Head area.

Cerorhinca monocerata - Rhinoceros Auklet

In North America the breeding range of this large auklet is primarily from northwestern Washington to southeastern Alaska, although it is reportedly an uncommon breeder in Oregon and as far south as central

California. It winters on the open sea off the coast of Washington, Oregon, and California, and is known to be in Oregon offshore waters from August until March. The rhinoceros auklet feeds on a typical alcid diet of small fish and crustaceans. It is an uncommon breeder and an occasional migrant and winter resident in the Yaquina Head area.

Ptychoramphus aleuticus - Cassin's Auklet

Cassin's auklet is a tiny alcid that occurs throughout the year on the Oregon coast. It breeds on offshore rocks from southeast Alaska to Baja California, and winters on the nearby ocean from Vancouver Island to Baja California. Cassin's auklet is commonly found off the mouths of harbors and bays (Gabrielson and Jewett 1970:316) and seems to prefer rough water (Cogswell 1977:273). It is an occasional migrant and winter resident of the Yaquina Head area.

Fratercula cirrhata - Tufted Puffin

The tufted puffin is an abundant breeding bird on the Oregon coast, where it nests on steep slopes of offshore rocks and rocky headlands. It nests in burrows, which it digs using its feet and large bill. Some tufted puffins have been known to remain in Oregon throughout the winter, but this is not their usual pattern. The tufted puffin feeds predominantly on small fish, particularly anchovies, herring, and smelt. Tufted puffins breed on offshore rocks at Yaquina Head, and in the past they also were reported to breed on the headland itself (Roy Lowe, personal communication, December 1990).

Class PISCES

Order RAJIFORMES
Family RAJIDAE - Skates

Raja cf. *binoculata* - Skate, cf. Big Skate

The largest group of cartilaginous fishes, the skates are represented by six species in Oregon waters, four of which are found on the bottom in deep water. The other two species, the big skate (*Raja binoculata*) and the California skate (*R. inornata*), are common near shore or at moderate depths, although only the big skate has been observed in the vicinity of Yaquina Head (Jerry Butler, personal communication, December 1990). All of the skate remains recovered from the 1989 excavations at Yaquina Head are vertebrae, and although it was not possible to positively identify them to the species level, they are all referable to big skate.

Order CHIMAERIFORMES
Family CHIMAERIDAE

Hydrolagus colliei - Spotted Ratfish

The ratfish is distributed from southeastern Alaska to Baja California and the northern Gulf of California; it is most abundant from British Columbia to northern California. It is primarily a bottomfish, and is a common accidental catch for deep dragging trawlers and deep setting longliners (Lamb and Edgell 1896:17). The ratfish may be found at depths up to 913 m in the southern part of its range; from Washington state northward it is found close inshore (Eschmeyer et al. 1983: 59). In the Yaquina Head region the ratfish is very commonly caught on nearshore rocky reefs (Barker 1974:28). It currently has no commercial value and is considered a nuisance by modern fishermen. It is reported to have a rather unpalatable aftertaste (Lamb and Edgell 1986:17).

Order CLUPEIFORMES
Family CLUPEIDAE - Herrings

Clupea harengus pallasii - Pacific Herring

The Pacific herring ranges from Japan and Korea to Alaska and south to Baja California. It has been reported at lengths up to 46 cm, although most individuals are less than 30 cm long. The Pacific herring is an offshore resident that only very occasionally occurs in the intertidal zone, although it comes into bays and estuaries when spawning. In Oregon most herring populations spawn between January and March (Morrow 1983:178-79; Eschmeyer et al. 1983:71); in Yaquina Bay they spawn from mid-January to early April. In Yaquina Bay herring lay their eggs on the beach, on rocks, pilings, eelgrass, and seaweed (U.S. Fish and Wildlife Service 1968:9; Jerry Butler, personal communication, April 1989). Herring do not currently occur any closer to Yaquina Head than Yaquina Bay (Jerry Butler, personal communication, April 1989).

Herring were an important resource for aboriginal groups in the Pacific Northwest, and were harvested in enormous quantities during their spawning runs, when they aggregate in nearshore environments. Herring rakes and dip nets were utilized in harvesting these fish (Drucker 1939:83; Stewart 1977:76-77). Herring roe was also an important aboriginal resource. In addition to being the subject of major aboriginal and Euroamerican fisheries, herring serve another important economic role--they are a significant source of food for other fishes and for marine mammals.

Order SALMONIFORMES
Family SALMONIDAE - Trouts and Salmons

Oncorhynchus sp. - Pacific Trouts and Salmons

The five Pacific salmons, *Oncorhynchus gorbuscha* (pink); *O. keta* (chum); *O. kisutch* (coho); *O. nerka* (sockeye); and *O. tshawytscha* (Chinook), are all anadromous, being born in fresh water, migrating to the sea, and then returning to fresh water to spawn. The cutthroat trout (*O. clarkii*) and rainbow trout (*O. gairdnerii*) have both freshwater and anadromous populations. The species that were native to the Yaquina River are coho, fall Chinook, chum, winter steelhead, and cutthroat trout (Lisa Borgerson, personal communication, December 1990).

Order GADIFORMES
Family GADIDAE

Merluccius productus - Pacific Hake

The Pacific hake, which grows to nearly a meter in length, is common off the Oregon coast, where it forms schools at considerable depth (up to 980 m) during the daytime. At night hake rise to the surface and disperse to feed independently. Hake do occasionally come into bays and shallow inlets, particularly in summer and autumn (Lamb and Edgell 1986:44), and they do invade the nearshore rocky reefs that occur off Yaquina Head. Hake can be obtained in large quantities by trawling in the inner continental shelf zone, where they form large schools. However, nearshore fishing of hake would probably be best accomplished using hook and line. Hake meat is very soft and spoils rapidly; it would have to be either consumed or preserved quickly after having been caught.

Prior to the recent increase in commercial hake fishing, periodic die-offs, probably part of a natural population control phenomenon, would result in large numbers of dead and dying hake washing up on beaches (Jerry Butler, personal communication, April 1989). It seems unlikely that people would harvest fish from such a die-off, because of the likelihood of disease, and the rapidity with which hake meat spoils. On the other hand, Ron Pittard of Seaside remembers that in the early 1950's hake that were still alive occasionally washed up onto the Beach at Cannon Beach (Ron Pittard, personal communication, September 1990). It is not possible to identify the source of the hake remains recovered from 35LNC62. The hake could have been caught incidentally near shore, they could have been intensively harvested farther off shore, or they could have been collected from groups of fish washed up on shore.

Microgadus proximus - Pacific Tomcod

The tomcod is a smaller relative of the hake, attaining a length of up to 30 cm. Pacific tomcod range from central California to northwestern Alaska and generally occupy bottom habitats from approximately 27-219 meters. In summer and autumn, particularly in the evenings, juvenile tomcod may be abundant in the shallow bays and inlets over sandy or muddy bottoms (Eschmeyer et al. 1983:98; Lamb and Edgell 1986:42). Young tomcod are often caught with hook and line; because they school in nearshore shallow waters, they could also be caught with nets. The tomcod bones that have been recovered from 35LNC62 are fairly small, and represent juvenile individuals. Adult tomcods occur around the rocks at Yaquina Head some years, primarily in July and August, when they are spawning (Jerry Butler, personal communication, December 1990).

Order PERCIFORMES

The Perciformes is the largest order of vertebrates, including approximately 7500 species. Although groups of perciform fishes can be found in freshwater, deep seas, and oceanic waters throughout the world, they primarily occupy shallow water marine habitats, where they are the dominant group (Eschmeyer et al. 1983:195).

Family EMBIOTOCIDAE - Surfperches

The surfperches occur only in the North Pacific, where they occupy primarily inshore habitats, including the surf zone, tidepools, and kelp beds. Very few of the surfperches recovered from the 1989 Yaquina Head assemblage could be identified to the species level; however, at least two species of surfperch are represented. A few specimens were identified as striped surfperch (*Embiotoca lateralis*), and one specimen was tentatively identified as redtail surfperch (*Amphisticus rhodoterus*). These two species are the surfperches most commonly seen in the Yaquina Head area today (Jerry Butler, personal communication, December 1990).

Amphisticus rhodoterus - Redtail Surfperch

The redtail surfperch is very common in Oregon waters. It occurs from Vancouver Island to Monterey Bay, and is the most common surfperch caught in the surf north of central California. It grows to 41 cm, and is found primarily in the surf zone on exposed, sandy coastlines, and also in bays and backwaters. It may be found at depths up to seven meters (Eschmeyer et al. 1983:227; Goodson 1988:53).

Embiotoca lateralis - Striped Surfperch

The striped surfperch, which grows to 38 cm, occurs from southeastern Alaska to northern Baja California. Its favored habitats are cold water rocky coasts and kelp beds from 5-21 meters; it occasionally occupies sandy surf areas near rocks (Goodson 1988:51; Eschmeyer et al. 1983:229).

Family STICHAEIDAE - Pricklebacks

The prickleback family is a cold-water group that occurs primarily in the North Pacific. All pricklebacks are marine, and most species live inshore. They are bottom-dwellers; some reside in shallow, intertidal habitats, others prefer rocky subtidal areas, and a few occupy deeper waters over sandy bottoms. The few prickleback bones from the 35LNC62 assemblage were not identifiable beyond the family level with the comparative material available. The black prickleback, *Xiphister atropurpureus*, can be easily gathered in rocky or gravelly intertidal areas. The rock prickleback, *X. mucosus*, which favors rocky intertidal and inshore areas, mostly on exposed coasts, and the Pacific snake prickleback, *Lumpenus sagitta*, which occurs in shallow bays as well as in offshore habitats, are both easily caught with a hook and line (Lamb and Edgell 1986:76-86; Eschmeyer et al. 1983:274-54). The only prickleback commonly seen in the vicinity of Yaquina Head is the snake prickleback.

Order SCORPAENIFORMES
Family SCORPAENIDAE - Scorpionfishes and Rockfishes

Sebastes sp. - Rockfishes

Sebastes is the largest genus of fish on the Pacific coast of North America, and the rockfishes display a commensurately wide variety of adaptations. In the Pacific Northwest rockfish habitats include inshore bay areas, shallow tidepools, kelp beds, rocky reefs, and deep offshore banks over soft or rocky bottoms at depths up to 750 m. Unfortunately, the different species are very difficult to distinguish from one another osteologically, and no attempt was made to do so with the rockfish remains recovered from the Yaquina Head assemblage. The most abundant rockfish in the Yaquina Head area today is the black rockfish (*S. melanops*); the copper rockfish (*S. caurinus*) is also commonly seen in the area (Jerry Butler, personal communication, December 1990).

Family HEXAGRAMMIDAE - Greenlings and Lingcod

The Hexagrammidae is a small family limited in distribution to the North Pacific. Greenlings are coldwater bottom fishes and, with the exception of the lingcod, are generally restricted to shallow water.

Hexagrammos sp., *Oxylebius pictus* - Greenlings

There are three greenlings belonging to the genus *Hexagrammos* that are found in Oregon waters: *H. decagrammus*, the kelp greenling, *H. lagocephalus*, the rock greenling, and *H. stelleri*, the whitespotted greenling. The painted greenling, *Oxylebius pictus*, is also found in Oregon. The three species of *Hexagrammos* are all moderate-sized fish; their maximum recorded sizes range from 48 cm for the whitespotted greenling to 61 cm for the rock greenling. The painted greenling is a smaller fish, rarely more than 15 cm, although specimens have been recorded as large as 25 cm (Hart 1973:463-471). Species determinations were not possible for the greenlings recovered from the 1989 excavations at site 35LNC62.

All four of the greenlings described above are found near shore in rocky areas; the kelp, whitespotted, and painted greenlings may also be found at depths up to 45 or 50 m. The rock greenling is found along shallow, rocky, exposed coastlines. The kelp greenling is often found in kelp beds, and is overwhelmingly the dominant greenling found in the vicinity of Yaquina Head today.

Ophiodon elongatus - Lingcod

The lingcod is much larger than its greenling cousins, and has been recorded at lengths up to 152 cm and weights up to 45 kg. It prefers rocky habitats, and is found near shore and at depths up to 425 m. It is a powerful and aggressive fish and can be fished along shores and over reefs using heavy line. It is also a favored catch for spear fishermen. The lingcod has large, sharp teeth, and is a voracious predator, feeding mostly on other fish, including herring, flounder, rockfish, cod, pollock, and hake (Goodson 1988:86; Hart 1973:467-469).

Hilary Stewart (1977:56-7) describes a wooden lure used by Indians of the Northwest Coast for catching lingcod. The lure was pushed into deep water using a long pole or spear, and then freed by suddenly jerking the pole upwards. The lure was shaped in such a way that it would slowly rise to the surface spinning, its speed decreasing as it rose. The curious lingcod would follow the lure to the surface, where it could then be speared or caught with a dip-net.

Family COTTIDAE - Sculpins

The sculpins are a large family of cold-water, mostly bottom-dwelling fishes. The family includes marine and freshwater species, and a few brackish water species as well. There is considerable variation in sculpin habitats, and representatives of this family may be found in virtually all substrate types and water depths. The rocky intertidal zone is home to a number of sculpins, and many of the fishes observed darting about in Pacific Northwest tidepools are sculpins (Hart 1973:472; Lamb and Edgell 1986:131; Goodson 1988:76). Buffalo sculpins (*Enophrys bison*) make up the bulk of the sculpins recovered from the 1989 excavations at Yaquina Head; smaller quantities of bones representing Pacific staghorn sculpin (*Leptocottus armatus*), red Irish lord (*Hemilepidotus hemilepidotus*), and cabezon (*Scorpaenichthys marmoratus*) were also recovered.

Enophrys bison - Buffalo Sculpin

The buffalo sculpin grows to 37 cm, and ranges from the Gulf of Alaska to Monterey Bay. It is common in inshore rocky and sandy areas, and rarely occurs in water deeper than 15 m. Shorebound anglers can easily catch this sculpin, which eagerly takes a variety of baits. Even a large buffalo sculpin has a relatively small amount of flesh available (Lamb and Edgell 1986:165).

Hemilepidotus cf. *hemilepidotus* - Red Irish Lord

The red Irish lord is a relatively large sculpin, attaining lengths up to 51 cm, although specimens larger than 30 cm are rare. Its normal range extends from the Kamchatka Peninsula, U.S.S.R. to Monterey Bay, California; it is more common in the northern part of its range. Although it may occur in depths up to nearly 50 m, the red Irish lord generally prefers nearshore rocky reefs and intertidal areas. It is a fairly sluggish fish, and is easily caught with a hook and line from rocky shorelines or over shallow reefs (Lamb and Edgell 1986:166; Goodson 1988:78; Eschmeyer et al. 1983:170-71). The brown Irish lord (*Hemilepidotus spinosus*) is also found in the Yaquina Head vicinity, and it is possible that some of the specimens identified as referable to red Irish lord may, in fact, be brown Irish lord.

Leptocottus armatus - Pacific Staghorn Sculpin

The Pacific staghorn sculpin, which can grow to 46 cm, is distributed from the Bering Sea to Baja California. It is a nearshore fish, and is most commonly found over sandy, silty, or muddy bottoms in bays, estuaries, and inlets; occasionally staghorns will penetrate the lower reaches of freshwater and coastal streams. This sculpin is easily caught with a hook and line, and will readily take almost any bait; in turn, the staghorn sculpin is eaten by cormorants, sea lions, and other predators (Lamb and Edgell 1986:168; Goodson 1988:79; Eschmeyer et al. 1983:175).

Scorpaenichthys marmoratus - Cabezon

The largest of all the sculpins, the cabezon is generally more than 46 cm, and has been recorded up to 99 cm and 11 kg. It is a common fish, and ranges from Sitka, Alaska to central Baja California. It occurs from shallow to moderate depths (1-76 m) over rocky, shell-encrusted bottoms, where molluscs and crustaceans, its preferred foods, are abundant. It may be caught with hook and line from shore or from boats, particularly near kelp beds. Cabezon aggregate when spawning, and at that time (winter) are particularly vulnerable to spear fishermen. The flesh of the cabezon, although a bluish-green color until cooked, is quite good to eat; the roe, however, is poisonous to humans (Lamb and Edgell 1986:163; Eschmeyer et al. 1983:182-83; Goodson 1988:75).

Order PLEURONECTIFORMES

The Pleuronectiformes, or flatfish, are unique among fishes in that their skulls are asymmetrical and both eyes are on the same side of the head. They begin life symmetrical, with one eye on each side of the head, but within a short time one eye begins migrating towards the other, and a corresponding twisting of the skull occurs to accommodate this migration. Flatfish live on the ocean bottom, where they lie on their eyeless side, with the eyed side up. Fish that have eyes on their right side are called right-eyed; those with eyes on the left side are called left-eyed. Although which side is eyed is generally species-dependent, a few species have both right- and left-eyed individuals. There are six families of flatfish; only two of these, the Bothidae, or left-eyed flounders, and the Pleuronectidae, or right-eyed flounders, occur in the Pacific Northwest.

For the most part it was not possible to further identify the flatfish from the Yaquina Head assemblage with the comparative osteological material available; the only species positively identified was starry flounder (*Platichthys stellatus*). The species that are most commonly found in the Yaquina Head area today are starry flounder, sand sole (*Psettichthys melanostictus*), butter sole (*Isopsetta isolepis*), and juvenile English sole (*Parophrys vetulus*). These species all belong to the family Pleuronectidae.

Family PLEURONECTIDAE - Righteye Flounders

Platichthys stellatus - Starry Flounder

The starry flounder is a widely distributed fish, occurring from Korea and Japan to Alaska and the Bering Sea, and south to southern California. From northern California to the Bering Sea it is one of the most abundant flounders in nearshore areas. It is also one of the largest of the true flounders, reaching lengths of 90 cm. Starry flounders may be either right-eyed or left-eyed; in Japan virtually all are left-eyed, but from California to southeast Alaska 50-60% are left-eyed; numbers of left-eyed individuals increase with latitude (Hart 1973:631-32).

The starry flounder is found mostly near shore, and often in estuaries; it has been reported from water as deep as 275 m, however. In at least some parts of its range there is a tendency for seasonal inshore-offshore movements, with populations occurring in very shallow water and in estuaries in the summer, and migrating into deeper water in the winter (Morrow 1983:213-14). Fishing data from Oregon estuaries indicate that in much of the state starry flounders are caught near shore from spring until early fall, with the highest catches generally being in the spring (Gaumer 1973a-19731, 1974; Gaumer, et al. 1974). Juvenile starry flounder are found in inshore waters throughout the year.

Class MAMMALIA

Order INSECTIVORA

Family SORICIDAE - Shrews

Shrews are small mammals with poor vision and highly developed senses of hearing, smell, and touch. They live primarily on the ground, although a few dig burrows, and some are semiaquatic. There are six species of shrew that occur on the Oregon coast: the wandering shrew (*Sorex vagrans*), the dusky shrew (*S. obscurus*), the Yaquina shrew (*S. yaquinae*), the Pacific shrew (*S. pacificus*), the marsh shrew (*S. bendirei*), and the Trowbridge shrew (*S. trowbridgei*). The species of the single shrew specimen identified from the 1989 Yaquina Head assemblage was not determined.

Family TALPIDAE - Moles

Moles are larger than shrews, except for shrew-moles, which are the smallest moles in North America. Most moles are highly adapted for a burrowing life, with strong, broad front feet and modified shoulders and forelegs. Shrew-moles are more like shrews in habits; they do not create deep burrows with molehills, but rather make shallow burrows in loose topsoil. There are three species of mole on the Oregon coast: the American shrew-mole (*Neurotrichus gibbsi*), the Townsend mole (*Scapanus townsendi*), and the coast mole (*S. orarius*). The single specimen of mole recovered from the 1989 excavations at 35LNC62 was not identified to species.

Order LAGOMORPHA
Family LEPORIDAE - Hares and Rabbits

There are only two species of leporid that occur along the Oregon coast: the snowshoe hare (*Lepus americanus*), and the brush rabbit (*Sylvilagus bachmani*). Snowshoe hares are very reclusive and are not often seen; they occupy densely vegetated habitats, including Douglas fir forests, dense stands of Sitka spruce and salal, alder forests with a dense understory of salmonberry and other shrubs, and cedar swamps (Maser 1984:124-127).

The brush rabbit occupies the thick, brushy edges of various habitats, and does not venture very far from brushy thickets where it can rapidly retreat when frightened. Despite this, it is preyed upon by a number of other animals, including bobcats, mink, weasels, skunks, foxes, coyotes, and some raptors (Maser 1984:128-131). It was not possible to assign a more specific identification to the single leporid bone fragment that was recovered from the 1989 excavations at Yaquina Head.

Order RODENTIA
Family CASTORIDAE - Beavers

Castor canadensis - North American Beaver

The beaver is the largest extant rodent in North America. It is primarily an aquatic mammal, and along the Oregon coast its habitat includes alder forests alongside large and small streams, freshwater willow and sedge marshes, coastal lakes, tideland rivers, and mountain rivers. The beaver's diet is vegetarian, and along the Oregon coast includes red alder and willow bark, salmonberry, salal, deerfern, swordfern, and sedges. In spring and early summer skunk cabbage is eaten, as well. The beaver's pelt is highly valued,and was the primary stimulus for the North American fur trade (Maser 1984:176-180).

Family MICROTIDAE - Voles

Members of the vole family occupy a variety of different habitats, and occur in deserts, mountains, and coastal regions. Although most voles are terrestrial in habits and burrow deep into the ground, some are arboreal, and some are aquatic (such as the muskrat, which is the largest vole in the world). There are seven species of vole, including the muskrat, that occur along the Oregon coast.

The two specimens identified as vole from the 1989 Yaquina Head assemblage were not identified to species, but were far too small to be muskrat. The other six voles that occur on the central Oregon coast include: the California red-backed vole (*Clethrionomys californicus*), the white-footed vole (*Arborimus albipes*), the red tree vole (*A. longicaudus*), the Townsend vole (*Microtus townsendi*), the long-tailed vole (M. longicaudus), and the Oregon, or creeping vole (*M. oregoni*).

Order CETACEA

The order Cetacea, which includes whales, dolphins, and porpoises, is represented in the 1989 assemblage from 35LNC62 by at least two species: three specimens represent unidentified dolphin (family Delphinidae), and nine specimens represent unidentified whale (family unidentified). The remainder of the cetacean bones were not further identifiable. In most cases, these unidentifiable specimens were assigned to the category cetacean on the basis of bone texture, and it is very likely that a number of the fragments so identified may actually be fragments of the same bone. Because of this, the number of specimens attributed to cetacean is probably highly inflated relative to other orders of mammals.

A number of species of whale, dolphin, and porpoise occur along the Oregon Coast. Grey whales pass the tip of the headland on their annual migrations north and south (Bureau of Land Management 1983:18). During archaeological testing at 35LNC62 in September, 1986, tourists reported seeing killer whales (actually dolphins) in the vicinity of Yaquina Head.

Order CARNIVORA
Family PHOCIDAE - True Seals

Phoca vitulina - Pacific Harbor Seal

The Pacific harbor seal occurs in the eastern North Pacific and ranges from the Aleutian Islands to Baja California. Harbor seals are commonly found throughout the year along the Oregon coast. They occur in nearshore coastal habitats, and are found in bays, estuaries, and occasionally in freshwater river systems. Harbor seals haul out on rocks, islands, reefs, sand bars, and mudflats; their hauling out places are always near fresh water (Mate 1984:438-439). Harbor seals haul out on rocks in or near the intertidal zone below Yaquina Head (Bureau of Land Management 1983:13).

The monogynous breeding habits of harbor seals do not foster territoriality or strong competition among males and, correspondingly, there is no selective advantage in larger, more aggressive males (Mate 1984:439). Harbor seals are therefore not strongly sexually dimorphic with respect to size, and it is difficult to distinguish between males and females from postcranial skeletal elements.

Harbor seal pupping season varies geographically, occurring progressively later in the year with increasing latitude. Along the Oregon coast births occur primarily in April and May, although they have been recorded as early as mid-February and as late as mid-June (Mate 1984:440).

The harbor seal remains that have been recovered from Yaquina Head include specimens representing mature adults as well as juveniles of varying degrees of development. Unfortunately, due to the relatively long season of birth for harbor seals, as well as a limited available sample of juvenile comparative specimens, it is difficult to use the harbor seal assemblage for seasonal interpretations, except in a very general way.

Family OTARIIDAE - Sea Lions and Fur Seals

Callorhinus ursinus - Northern Fur Seal

Currently, northern fur seal breeding grounds in the eastern Pacific are limited to only two areas: one in the Pribilof Islands, which is the largest population of northern fur seals in the world, and a second, small population on San Miguel Island, California. The San Miguel population was established only quite recently, in the 1960s (King 1983:61). Archaeological evidence from several prehistoric sites along the Northwest Coast indicates that fur seals were far more widely distributed in the prehistoric past, and that there were probably rookeries located along the Oregon coast (e.g., Rambo 1978:71; Calvert 1980; Greenspan and Wigen 1987:59; Bennett 1988:26; Lyman 1988).

On the Pribilof Islands pupping and breeding season is from mid-June until late July, after which adult females and subadults of both sexes migrate south, some as far as southern California. Some adult males also migrate; others remain in northern waters throughout the year. Northern fur seals are pelagic except during breeding season, and generally they stay within 16 to 160 km offshore. Today, they are very rarely seen on shore on the Oregon coast (Mate 1984:456-57).

Two specimens from the 1989 excavations at 35LNC62 were tentatively identified as *C. ursinus*, both of them representing individuals estimated to be less than 10 weeks old. A third specimen was identified as either *C. ursinus* or *Zalophus californianus*; if it is *C. ursinus*, it appears to be approximately three months old. The 1986 assemblage included three specimens identified as 10-11 week-old *C. ursinus*, and five other specimens representing adult females and older juveniles (Greenspan and Wigen 1987:59).

Eumetopias jubatus - Steller Sea Lion

The Steller, or northern, sea lion is the largest of the sea lions. In the eastern Pacific it ranges from San Miguel Island, California, north to the Pribilof Islands (King 1983:20). Steller sea lions occasionally haul out on the rocks below Yaquina Head (Bureau of Land Management 1983:13). Seal Rock, approximately 20 km south of Yaquina Head, appears to have been the site of a Steller sea lion rookery during the recent prehistoric past (Snyder 1978; Lyman 1988: 254).

Steller sea lions rarely breed or haul out on the mainland, preferring rocky areas on offshore islands. In Oregon females arrive at rookeries in the late spring, and very shortly thereafter give birth to a single pup. Males arrive at the breeding grounds in June, and compete amongst themselves to establish breeding territories. Mating occurs within two weeks after pupping, and each male will mate with estrous females within his territory (Mate 1984:449-50).

The mating season continues until mid-July, at which time adult males in California, Oregon, and Washington leave the breeding ground and go north into British Columbia and Alaska. By the end of October no adult males remain along the Oregon coast, although females and pups may overwinter there (Mate 1984:449-50).

The competition amongst males for females and breeding territories selects for large, aggressive males, and there is considerable sexual dimorphism with respect to size in this species (Mate 1984:450). The 1989 excavations at 35LNC62 resulted in the recovery of a single specimen attributed to adult male and another attributed to adult female *E. jubatus*. In addition, there are several specimens representing juveniles in various stages of development.

Zalophus californianus - California Sea Lion

Along the west coast of North America the California sea lion is distributed primarily in Californian waters, ranging from the Channel Islands south to the southern tip of Baja California, Mexico, and throughout the Gulf of California. In mid-July, at the end of the breeding season, some adult and subadult males move north to overwinter in British Columbia. Although there are currently no *Z. californianus* breeding grounds in Oregon, migrant males are not uncommon in

Oregon waters during the fall and winter, with peak populations occurring in September and October (Mate 184:452-53). The representation of juveniles and adult females, as well as adult males in the prehistoric Seal Rock assemblage suggests the distribution of breeding grounds was different in the prehistoric past than it is today; it has been suggested that Seal Rock may, in fact, have been used as a rookery for California sea lions as well as for Steller sea lions (Lyman 1988: 255-56).

The 1989 excavations at Yaquina Head yielded only one specimen attributed to *Z. californianus*. This was a single tooth representing a sub-adult individual of undetermined sex. The 1986 excavations had yielded one specimen representing an adult male, and one specimen tentatively assigned to *Z. californianus* (Greenspan and Wigen 1987:58).

Family PROCYONIDAE - Ringtails, Raccoons, and Allies

Procyon lotor - Raccoon

Although there are currently seven recognized species of raccoons (Maser 1984:280), only one occurs in the continental United States, *Procyon lotor*. The raccoon uses virtually all habitat types along the Oregon coast. Raccoons are nocturnal, and although a few may rest in trees, most rest on or near the ground during the day. Raccoons are omnivorous, and will eat whatever appeals to them, including seafood, freshwater molluscs, small mammals, birds and bird eggs, and fruits. Raccoons are valued for their pelts, and are considered good sport animals by hunters (Maser 1984:280-287).

Family MUSTELIDAE - Mustelids

Enhydra lutris - Sea Otter

Sea otters were formerly widely distributed on both sides of the Pacific. In the eastern Pacific, they ranged from central Baja California north along the entire coast of North America (Kenyon 1975). Sea otter pelts were sought after by fur traders of the eighteenth and nineteenth centuries, and overhunting resulted in their extinction in much of their former range. They have been gone from the Oregon coast since 1906. Although in parts of California their numbers have increased significantly since they were declared a protected species in 1911, reintroductions in Oregon have not been successful (Mate 1984:430).

Although sea otters do enter bays and haul out on land, they never stray far from the open sea. Their preferred habitats are waters next to rocky coasts near extensive underwater reefs and kelp beds, such as those in the intertidal zone surrounding Yaquina Head. They dive for food on the ocean bottom in water up to 54 m. Hauling out places are generally rocky points, or occasionally sand beaches or spits (Kenyon 1975:57).

Sea otters do not have a fixed breeding season and have been known to mate throughout the year; however, most mating seems to occur in June. Pups are born after 10-12 months gestation, most frequently in spring or summer (Kenyon 1975:235-39). A number of juvenile specimens are present in both the 1989 and 1986 assemblages from 35LNC62; it was not possible to use these specimens as seasonal indicators due to the inadequate age data available in the comparative collections, as well as the lack of a fixed breeding and pupping season. A number of adult specimens were recovered during both excavation seasons, as well.

Family FELIDAE - Cats, Lynxes, and Allies

Lynx rufus - Bobcat

Bobcats use, to some extent, nearly all habitats on the Oregon coast except for coastal lakes and tideland rivers. They most commonly occupy brushy areas, and they often travel along old logging roads. They are carnivorous, and their main prey consists of small mammals, particularly brush rabbits; they will also prey on large animals, such as deer and domestic sheep. Birds and insects may contribute to their diet as well. Euroamericans have trapped bobcats primarily for their fur; although they have excellent flesh, they are not generally eaten (Maser 1984:347-352). It is not clear from the ethnographic record whether bobcats were considered a food source for Native Americans in western Oregon.

Order ARTIODACTYLA - Even-toed Ungulates
Family CERVIDAE - North American Deer, Elk, and Allies

Cervus elaphus - Elk

Elk were once abundant in western Oregon, but hunting and destruction of their habitat have resulted in their being pushed to increasingly remote areas. Elk use most of the wooded habitats in western Oregon, while avoiding beach and dune habitats. In densely vegetated habitats, elk tend to form small groups or to remain solitary, while in open areas they will aggregate in larger groups. They feed primarily on grasses and slough sedge, as well as some browse. In the summer and fall they also eat various forbs (Maser 1984:355-364).

Odocoileus sp. - Deer

Although only the mule deer (*O. hemionus*) is today present on the Oregon coast, formerly the white-tailed deer (*O. virginianus*) was apparently distributed in that region as well (Bailey 1936:90; Livingston 1987). Little is known about the habits and habitats of the white-tailed deer along the Oregon coast, and the following discussion will be limited to descriptions of the mule deer.

It is possible to distinguish osteologically between mule deer and white-tailed deer on the basis of mandibular molariform tooth measurements (Rees 1971; Livingston 1987). Unfortunately, the specimens recovered from Yaquina Head did not lend themselves to this type of analysis, and no attempt was made to identify the *Odocoileus* remains to species.

Odocoileus hemionus - Mule Deer

Along the Oregon coast the mule deer occupies all habitats except the coastal lake and tideland river habitats, although it is primarily an occupant of the forest edge. In the coastal zone the mule deer exhibits no regular pattern of seasonal migration, and may be a year-round resident of any area without deep snow. Preferred habitats are those with the best supply of preferred forage, minimal duration of snow cover, and reliable protection from winter winds. Mule deer are primarily browsers. On the Oregon coast their diet includes trailing blackberry, red huckleberry, salal, and various grasses and forbs in fall, winter, and early spring, and thimbleberry in summer and early fall. Mule deer are not herd animals, and seldom form large groups.

SEASONALITY

Seasonal migration patterns of various birds and mammals provide modern analogs that can be used to infer the seasonality of prehistoric resource procurement. The presence of juvenile animals of species with restricted birthing seasons can be used in a similar fashion. There are such indicators among the faunal remains from Yaquina Head. Table 5-3 shows the seasonal availability of indicator species identified among the vertebrate fauna collected during the 1986 and 1989 excavations.

As discussed above, Steller sea lion males arrive at Oregon breeding grounds in June, and leave following the end of the mating season in mid-July. By the end of October, adult males are gone from the Oregon coast. If this pattern occurred in prehistoric times as well, the presence of adult male Steller sea lion remains in the cultural deposits at Yaquina Head is a good indicator of summer/early fall occupation. Although it has been amply demonstrated that the breeding ranges of pinnipeds in the eastern north Pacific Ocean have undergone

Table 5-3. Seasonal availability of indicator species identified among the vertebrate fauna at Yaquina Head.

Taxon	Winter	Spring	Summer	Fall
BIRDS				
Pacific loon	———			
Small loon	———			
Western grebe	———	- - -		- - -
Red-necked grebe	———			———
Horned grebe	———	———		———
Albatross		———	———	———
Fulmar	———	-	———	———
Shearwater		- - -	- - - ———	——— - - -
Storm petrel	- - -	- - - ———	———	- - -
Bufflehead	———	———		———
Rhinoceros auklet	———	———	———	———
Unidentified juveniles			———	———
MAMMALS				
Adult male Steller sea lion			———	- - -
Juvenile otariids (less than 6 months)	- - -		———	———
FISH				
Pacific herring	———	——— -		

considerable change over the last several hundred years (Greenspan and Wigen 1987; Lyman 1988a, 1989), there is no reason to believe that there have been major changes in the seasonal migration patterns of species that bred on the Oregon coast in the past and continue to do so today.

Three Steller sea lion specimens, two northern fur seal specimens, and two unidentified otariid specimens were estimated to be less than three months old at time of death. As all three of the otariid species that occur in the Pacific Northwest give birth primarily in the late spring or summer months, the presence of very young individuals suggests summer or fall exploitation. In addition, there were several otariid specimens judged to be less than six months old, adding further support to the inference that the headland was occupied during the fall.

One specimen each representing immature common murre, marbled murrelet, western grebe, unidentified shorebird, and unidentified medium-sized bird were recovered. The development of these bones was such as to suggest death in the late summer or early fall. Common murres currently breed and winter at Yaquina Head, and marbled murrelets and western grebes use the area during migration and wintering.

Deriving seasonal inferences from the fulmar and albatross data is less straightforward. The fulmar is a common resident off the coast of Oregon from September until March or April (Gabrielson and Jewett 1970: 84-85; Peterson 1961:9). Although stragglers do occur at other times of the year (one of us has observed them off the southern Oregon coast in June), they are present primarily in the winter and fall. The albatross is more difficult to pinpoint, as the short-tailed albatross has been sighted only rarely in Oregon, although, as discussed above, it was undoubtedly much more common prior to the end of the last century. It appears, from piecing together the literature, that the short-tailed albatross was most likely present off the Oregon coast primarily from May through October.

Considered altogether, the albatross and fulmar data could be used to support two alternative hypotheses: (1) year round exploitation of offshore birds, with the fulmars indicating primarily fall and winter and the albatross indicating primarily spring and summer, or (2) more intensive exploitation of offshore birds during the restricted time of year when both species were off the coast of Oregon--September and October. Either interpretation could be correct, although the second is favored, primarily because in a number of instances the albatross and fulmar remains co-occur in the same unit levels. Furthermore, if these birds were hunted on the ocean, it seems that late summer and early fall would be a more favorable time to go out to sea than wintertime.

On the other hand, if these birds were not hunted on the ocean, but were collected from the beaches, the fulmars almost certainly would be a winter indicator. When fulmars wash up on the beach it is generally following a severe winter storm (Roy Lowe, Kathy Liska, personal communication, December 1990).

At least two species of loons were recovered from Yaquina Head. One is the common loon, which has been recorded in Lincoln County during every month of the year (Gabrielson and Jewett 1970:64). In addition to the common loon, a few specimens of smaller loons, either Pacific or red-throated, were recovered. Both of these species occur uncommonly in the Yaquina Head area, primarily in the wintertime (Gabrielson and Jewett 1970:67-69; Bureau of Land Management 1983:14). Red-necked and horned grebes are along this part of the Oregon coast in the fall and winter, and the western grebe is most common in the wintertime, although it may be in the area in the fall and spring as well (Gabrielson and Jewett 1970:70-79). Although storm-petrels may be present throughout the year, they are best known in the summer (Gabrielson and Jewett 1970: 86-89). The bufflehead was formerly abundant

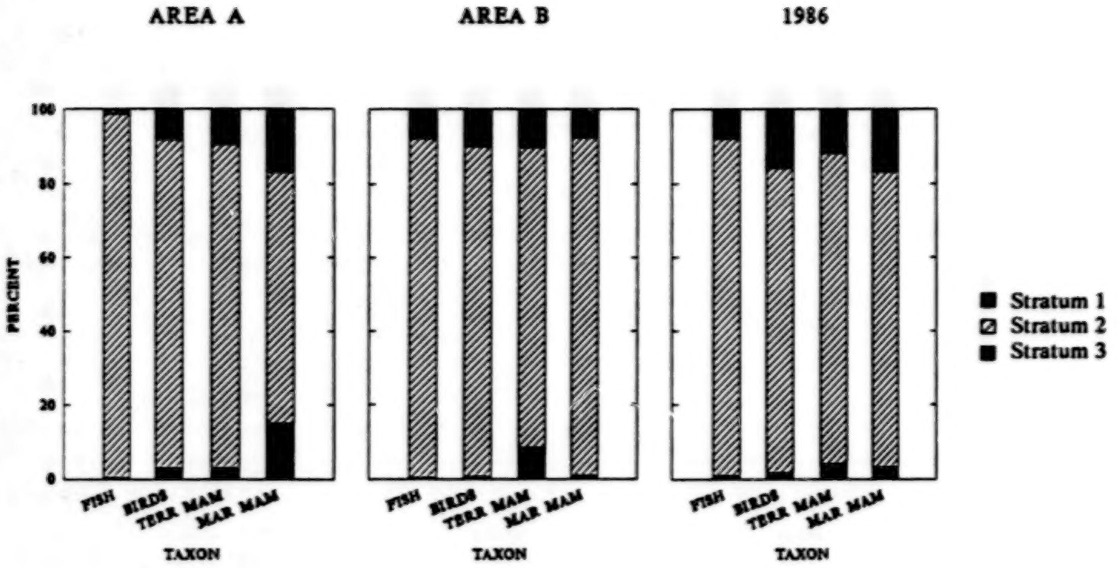

Figure 5-1. Percentage of fish, bird, terrestrial mammal, and marine mammal bones recovered per stratum for each site area.

along the Oregon coast from mid-October to mid-April (Gabrielson and Jewett 1970:163), and the rhinoceros auklet has been recorded as an uncommon breeder and occasional winter visitor to Yaquina Head (Bureau of Land Management 1983:14).

As discussed above, herring are likely to have been accessible only when they were spawning. In Yaquina Bay, the nearest herring spawning area, herring spawn from mid-January to early April.

INTRASITE COMPARISONS

As illustrated in Table 5-2, there are marked differences between the distribution of bone in Stratum 2 (the shell component) and the distribution of bone in Strata 1 and 3. The most striking aspect of these differences is in the quantities of bone recovered from each stratum, which may reflect differential use of the site, or may be a function of taphonomic factors.

Figure 5-1 compares the percentage of bones recovered from each stratum for four major taxonomic categories: fish, birds, terrestrial mammals, and marine mammals. Each of the three graphs in Figure 5-1 keeps the site area constant, and compares the distribution by stratum for the four taxonomic categories. For example, the first graph in Figure 5-1 shows that in Area A, the overwhelming majority of the fish remains were recovered from Stratum 2, with only a very small

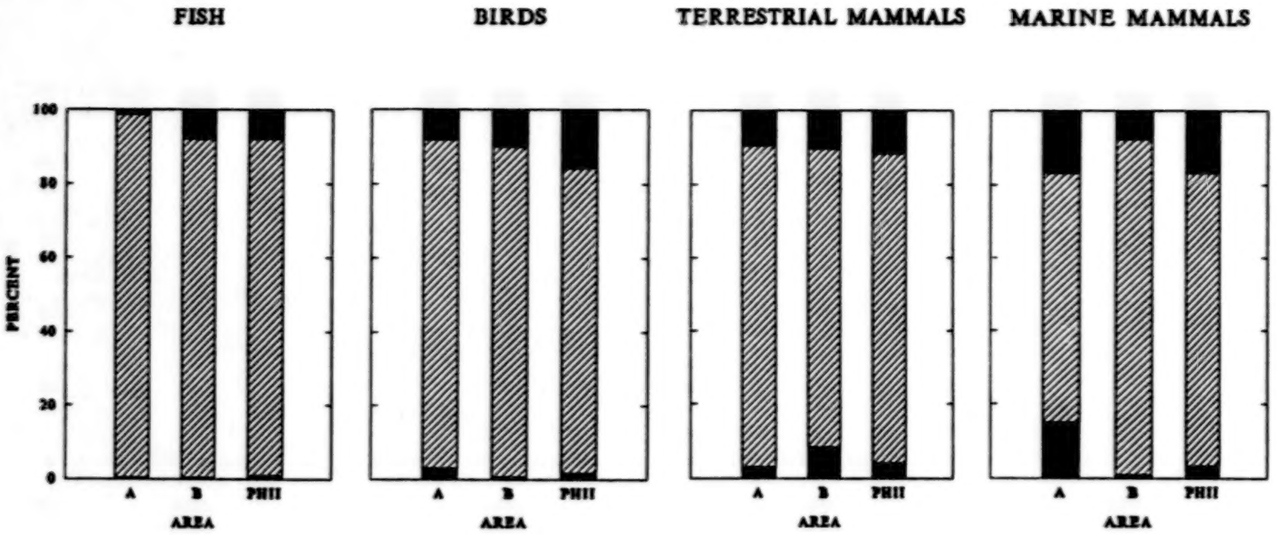

Figure 5-2. Percentage of bones recovered per stratum in each site area by major taxonomic category.

proportion recovered from Strata 1 and 3. Birds and terrestrial mammals show relatively greater representation in Strata 1 and 3 than do fish, but they are still most strongly represented in Stratum 2, and marine mammals show a slightly increased representation in Strata 1 and 3.

Figure 5-2 presents the same information, but keeps the taxonomic categories constant for each of the four graphs in the figure. For example, the first graph in Figure 5-2 shows the proportion of the fish recovered in each stratum for each of the three areas; the second graph shows the proportion of birds recovered in each stratum for each of the three areas, etc.

Figures 5-1 and 5-2 show that the majority of the bones recovered from 35LNC62 were obtained from Stratum 2, regardless of taxonomic category or site area. The greatest deviation from this pattern is the distribution of marine mammals in Area A, where nearly 17% of the marine mammals were recovered from Stratum 1, 15% were recovered from Stratum 3, and the remaining 68% were recovered from Stratum 2.

Figure 5-3 illustrates the distribution of the different taxonomic categories within each stratum for Area A, Area B, and the 1986 excavations. In each area the proportion of fish is greatest in Stratum 2. In Area A, Stratum 2 stands in marked contrast to Strata 1 and 3, which are very similar to each other. The graph illustrating the distribution of taxonomic groups for the 1986 excavation area shows a similar tendency to that shown in Area A, but with much less contrast between

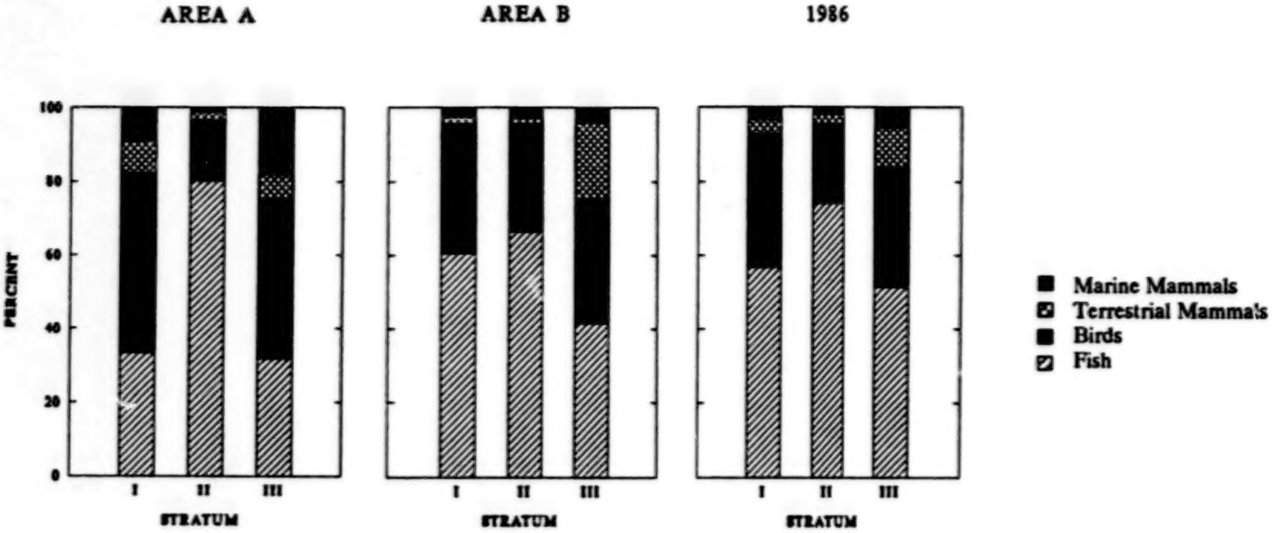

Figure 5-3. Distribution of taxa within each stratum by site area.

Stratum 2 and the other two strata. In Area B, the distribution is quite similar for Strata 1 and 2, while Stratum 3 shows a more even distribution of fish and birds than the other two strata. Figure 5-3 illustrates that within a given area, the relative proportions of fish, birds, terrestrial mammals, and marine mammals varies from stratum to stratum, and that this variation is most marked in Area A.

Figure 5-4 shows the same data, but presented in a different way. The three graphs presented in this figure show that for each stratum, the relative proportions of fish, birds, terrestrial mammals, and marine mammals is relatively similar in the different areas of the site. The stratum that shows the greatest amount of variation is Stratum 1, which shows a higher proportion of birds than fish in Area A, and higher proportions of fish than birds in Area B and in the portion of the site excavated in 1986.

It should be pointed out that the proportion of the assemblages that represent mammalian remains are artificially lowered in Figures 5-1 through 5-4, because unidentifiable mammal remains that could not be attributed to either the terrestrial or marine mammal categories are not included in these figures. In contrast, unidentifiable birds and unidentifiable fish are included in the fish and bird categories in Figures 5-1 through 5-4.

Unidentifiable cetaceans are also omitted from the data presented in these figures. Although a significant portion of the marine mammal remains were identified as cetacean (Table 5-1), their numbers are not directly comparable with the rest of the identified mammal remains

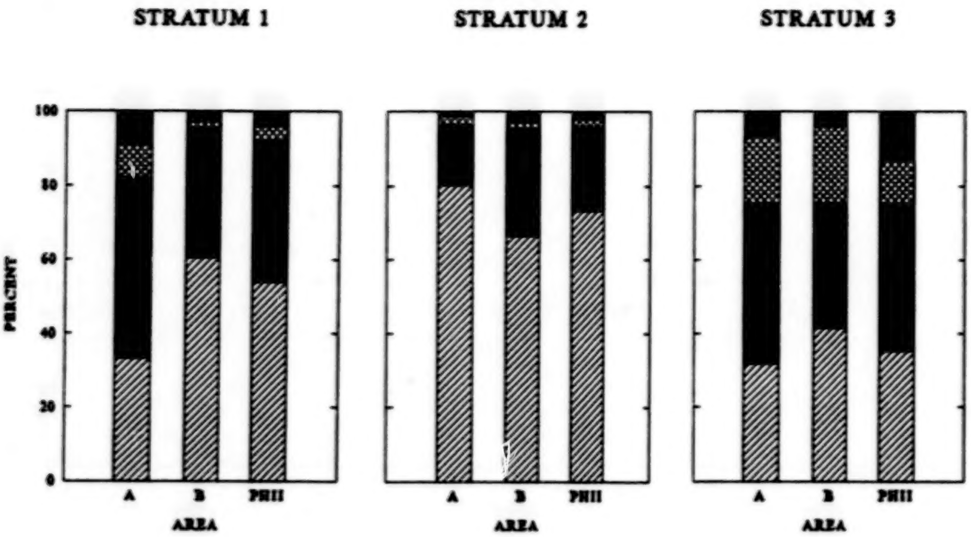

Figure 5-4. Distribution of taxa within each site area by stratum.

because of the way in which the material was assigned to the category "cetacean." In most cases, the unidentified cetacean material was identified on the basis of bone texture, and it is very likely that many of the small pieces so identified may actually be fragments of the same bone. This resulted in artificially high numbers in the marine mammal categories, and the unidentified cetacean category has been omitted from all statistical analyses.

In order to test for seasonal differences between strata and between site areas, three sets of chi square tests were run. In the first set (Tables 5-4 and 5-5) the following species are used to indicate winter (fall to early spring) procurement: Pacific loon, small loon, western grebe, red-necked grebe, horned grebe, fulmar, bufflehead, rhinoceros auklet, adult male California sea lion, and herring. Summer (late spring to early fall) indicators include albatross, shearwater, petrel, juvenile birds, juvenile otariids, and adult male Steller sea lion. It should be pointed out, however, that many of the birds that winter on the coast begin arriving at the coast as early as late summer or early fall, and that it is quite possible that many of the species used to indicate "winter" procurement could have been obtained earlier in the year.

As discussed above, it seems likely that the fulmar, in particular, may have been obtained primarily in the late summer or early fall. For that reason, a second set of chi-square tests was run, this time including the fulmar with summer, rather than winter indicators. These tests are shown in Tables 5-6 and 5-7. In a third set of tests (Tables 5-8 and 5-9), fulmar was excluded entirely.

Table 5-4. Chi-Square contingency table, winter and summer indicators in Strata 1 and 2, Area A and 1986, with fulmars included as winter indicators.

	STRATUM 1	STRATUM 2	TOTAL
SUMMER	9	88	97
WINTER	6	339	345
TOTAL	15	427	442

CHI SQUARE = 13.126

Table 5-5. Chi-Square contingency table, winter and summer indicators in Strata 1 and 2, Area B, with fulmars included as winter indicators.

	STRATUM 1	STRATUM 2	TOTAL
SUMMER	25	73	98
WINTER	59	153	212
TOTAL	84	226	310

CHI SQUARE = 0.183

Table 5-6. Chi-Square contingency table, winter and summer indicators in Strata 1 and 2, 1986/Area A, with fulmars included as summer indicators.

	STRATUM 1	STRATUM 2	TOTAL
SUMMER	9	99	108
WINTER	6	3238	334
TOTAL	15	427	442

CHI SQUARE = 10.637

Table 5-7. Chi-Square contingency table, winter and summer indicators in Strata 1 and 2, Area B, with fulmars included as summer indicators.

	STRATUM 1	STRATUM 2	TOTAL
SUMMER	41	206	247
WINTER	43	20	63
TOTAL	84	226	310

CHI SQUARE = 67.800

Table 5-8. Chi-Square contingency table, winter and summer indicators in Strata 1 and 2, 1986/Area A, with fulmars not included.

	STRATUM 1	STRATUM 2	TOTAL
SUMMER	9	88	97
WINTER	6	328	334
TOTAL	15	416	431

CHI SQUARE = 12.527

Table 5-9. Chi-Square contingency table, winter and summer indicators in Strata 1 and 2, Area B, with fulmars not included.

	STRATUM 1	STRATUM 2	TOTAL
SUMMER	25	73	98
WINTER	43	20	63
TOTAL	68	93	161

CHI SQUARE = 28.717

Stratum 3 is not included in this analysis, because only four specimens that could be used as seasonal indicators were recovered: two from Area A and one from the 1986 excavation; none was recovered from Area B. The specimens that were recovered all are summer indicators.

Table 5-4 compares winter indicators (including fulmar) and summer indicators in Strata 1 and 2 for Area A plus the area excavated in 1986. Table 5-5 makes a similar comparison for Area B. Table 5-4 shows that there is a statistical difference in the distribution of winter and summer indicators between Stratum 1 and Stratum 2 in the 1986/Area A portion of the site, with Stratum 1 showing a greater number of summer indicators and Stratum 2 showing a greater number of winter indicators. Table 5-5 indicates that the distribution of summer and winter indicators between strata in Area B is not statistically significant, with both strata showing a greater number of winter indicators than summer indicators.

When the fulmars are included with the summer indicators, the distribution of summer and winter indicators between strata is significant (although not strongly so) in both 1986/Area A and Area B (Tables 5-6 and 5-7). In 1986/Area A there are more summer than winter indicators in Stratum 1, and more winter than summer indicators in Stratum 2, while in Area B the summer and winter indicators are fairly evenly distributed in Stratum 1, and there are many more summer than winter indicators in Stratum 2 (the bulk of the fulmar remains recovered from 35LNC62 were recovered from Stratum 2, Area B).

When the fulmars are omitted from the analysis, both 1986/Area A and Area B show a statistically significant difference in distribution of summer and winter indicators between Stratum 1 and Stratum 2 (Tables 5-8 and 5-9). In 1986/Area A there are more summer than winter indicators in Stratum 1, and more winter than summer indicators in Stratum 2; the situation is reversed in Area B.

Without knowing what time of year the fulmars were actually procured, it is difficult to interpret these data. Nonetheless, a few observations can be made. Both strata and both site areas indicate procurement of vertebrate resources in the winter and in the summer, but the proportions of summer and winter indicators vary between strata and between site areas.

The next set of contingency tables compares the distribution of summer and winter indicators between 1986/Area A and Area B for each stratum individually. Table 5-10 shows that for Stratum 1, when fulmar is considered a winter indicator, there are more summer than winter indicators in 1986/Area A, and more winter than summer indicators in Area B, but that the differences between areas are not statistically significant. In Stratum 2 (Table 5-11) there are more winter than summer indicators in both areas, and the difference between areas is very slightly significant.

Table 5-10. Chi-Square contingency table, winter and summer indicators in 1986/Area A and Area B, Stratum 1, with fulmars as winter indicators.

	1986/AREA A	AREA B	TOTAL
SUMMER	9	25	34
WINTER	6	59	65
TOTAL	15	84	99

CHI SQUARE = 5.161

Table 5-11. Chi-Square contingency table, winter and summer indicators in 1986/Area A and Area B, Stratum 2, with fulmars as winter indicators.

	1986/AREA A	AREA B	TOTAL
SUMMER	88	73	161
WINTER	339	153	492
TOTAL	427	226	653

CHI SQUARE = 10.875

Table 5-12. Chi-Square contingency table, winter and summer indicators in 1986/Area A and Area B, Stratum 1 with fulmars as summer indicators.

	1986/AREA A	AREA B	TOTAL
SUMMER	9	41	50
WINTER	6	43	49
TOTAL	15	84	99

CHI SQUARE = 0.638

Table 5-13. Chi-Square contingency table, winter and summer indicators in 1986/Area A and Area B, Stratum 2 with fulmars as summer indicators.

	1986/AREA A	AREA B	TOTAL
SUMMER	99	206	305
WINTER	328	20	348
TOTAL	427	226	653

CHI SQUARE = 274.250

Table 5-14. Chi-Square contingency table, winter and summer indicators in 1986/Area A and Area B, Stratum 1 with fulmars not included.

	1986/AREA A	AREA B	TOTAL
SUMMER	9	25	34
WINTER	6	43	49
TOTAL	15	68	83

CHI SQUARE = 2.743

Table 5-15. Chi-Square contingency table, winter and summer indicators in 1986/Area A and Area B, Stratum 2 with fulmars not included.

	1986/AREA A	AREA B	TOTAL
SUMMER	88	73	161
WINTER	328	20	348
TOTAL	416	93	509

CHI SQUARE = 115.562

When fulmar is considered a summer indicator (Table 5-12), for Stratum 1 there are more summer than winter indicators in 1986/Area A, and approximately the same number of summer and winter indicators in Area B. The difference between the two areas is not statistically significant. Stratum 2 (Table 5-13) shows a greater number of winter than summer indicators in 1986/Area A, and a greater number of summer than winter indicators in Area B. The difference between the two areas is strongly significant.

When fulmar is omitted from the analysis, for Stratum 1 (Table 5-14) there are more summer than winter indicators in 1986/Area A, and more winter than summer indicators in Area B; these differences, however, are not statistically significant. Stratum 2 (Table 5-15), on the other hand, shows a fairly strong statistical difference between 1986/Area A, with more winter than summer indicators, and Area B, with more summer than winter indicators.

Tables 5-10 through 5-15 show that the seasonality of Stratum 1 does not vary significantly betweeen site areas, while that of Stratum 2 does. Again, as mentioned above, it is difficult to interpret the differences apparent in Stratum 2 without knowing the season of fulmar procurement.

SUMMARY AND CONCLUSION

The vertebrate faunal analysis of materials recovered from 35LNC62 indicates that a wide variety of marine and terrestrial animals were exploited. With the exception of a single beaver specimen, freshwater species are notably (although not surprisingly) absent. Although the numbers and proportions of different taxa vary between strata and site areas, fish, birds, marine mammals, and terrestrial mammals are all present from all three strata and from both areas of the site. The cultural deposits at 35LNC62 appear to be internally variable, with few strong patterns underlying the variability. One exception to this is the distribution of the overwhelming majority of the vertebrate fauna in Stratum 2 (the shell stratum), a pattern that may be more a function of taphonomic than of cultural factors.

The vertebrate fauna suggest that the site was occupied more or less throughout the year. In both areas of the site, and in Strata 1 and 2 there are indicators of winter and summer resource procurement. Stratum 3 contains evidence only of summer procurement; however, the numbers of seasonal indicators are so small that this is not seen as a strong indication that winter procurement did not occur in Stratum 3.

For the most part, the faunal assemblage from site 35LNC62 indicates exploitation of locally available resources. However, the exploitation of somewhat more remote habitats is suggested as well. Hake, fulmar, albatross, and shearwater remains suggest the utilization of offshore oceanic habitats, while herring, and possibly tomcod, indicate utilization of Yaquina Bay 6 km to the south.

CHAPTER 6

HUMAN SKELETAL REMAINS

by Brian E. Hemphill

Archaeological investigations at Yaquina Head in 1986 encountered two human burials. The first burial consisted of the remains of an infant; the second burial was that of an adult. Both burials were situated in close proximity to the cliff face and thus threatened with imminent destruction by erosion. In consultation with the Confederated Tribes of Siletz Indians, both burials were recovered and reinterred on the Siletz Reservation (Hemphill 1987).

Despite the extensive nature of the excavations, no additional human burials were encountered during the 1989 investigations at Yaquina Head. During the analysis of the 12,041 vertebrate faunal remains recovered, however, four isolated human bones were identified. These elements are briefly described below.

1. Left Scapula

A fragmentary left scapula was recovered from Level 10 in Unit 24. Laterally, the axial margin was complete from the inferior margin of the glenoid fossa superiorly to a point just inferior to the superior margin of the area of origin for Teres Major inferiorly. The inferior angle was not preserved, nor was the entire vertebral margin or superior angle. Superiorly, the medial aspect of the acromion process was preserved, but the lateral aspect had been lost. The coracoid process was well preserved, as only small areas of bone loss were observed upon the medial and lateral aspects. The glenoid fossa was also well preserved. Post-mortem damage was restricted to a small amount of cortical erosion at the superior aspect of the fossa margin.

Overall, muscle markings on this scapula were moderate to gracile. One exception to this pattern was the origin for the long head of the Triceps. Located just inferior to the glenoid fossa on the axial margin, this area of bone suggests slightly greater muscular robusticity than indicated from other areas of muscle attachment. There was no circumflex sulcus. Examination of the glenoid fossa indicates no evidence for any osteophytic development or eburnation. Combined with the size of the scapula and the complete fusion of all epiphyseal lines, this lack of degenerative osteoarthritis suggests that this scapula belonged to an adult over 23 years of age, but not of advanced age (Krogman 1962; McKern and Stewart 1957).

Due to the fragmentary nature of this scapula, few measurements were possible. Coracoid process length was 43.0 mm. The height of the glenoid fossa was 40.0 mm. Breadth of the glenoid fossa was 27.5 mm, and the axillo-glenoid angle was 34°. A glenoid fossa height in excess of 36.0 mm indicates masculinity (Stewart 1979).

Altogether, these data suggest that this scapula belonged to an adult male, probably in excess of 23 years of age at the time of death. This individual did not die at an advance geriatric age or suffer from any macroscopic pathologies to the left shoulder.

2. Right Fifth Metatarsal

This fifth metatarsal was recovered in an excellent state of preservation from Level 10 in Unit 23. Damage was limited to minor cortical erosion to the superior and lateral aspects of the distal head. The maximum length of this element was 68.5 mm. The size and conformation of this metatarsal indicated that it was from an individual who was an adult at the time death. There was no evidence of any gross pathological affliction. This includes complete absence of osteopathic lipping of the proximal articular surface.

3. Juvenile Right Radius

This fragment of a juvenile right radius recovered from Level 11 of Unit 23 preserved the proximal portion of the diaphysis, the bicipital tuberosity, and the proximal metaphyseal surface. The extremely small size of this right radius strongly suggests that this person died in the first year of life. This fragment is fractured just distal to the nutrient foramen distally. There was no evidence of gross pathological affliction. It should perhaps be noted that this element is not related to the infant burial encountered during the 1986 investigations, as a right radius was among the skeletal remains found with that individual (Hemphill 1987:69).

4. Mandibular Right Lateral Incisor

This tooth, recovered from Level 6 in Unit 11, included the complete crown and all but the periapical portion of the root of the permanent right mandibular lateral incisor. This tooth evinces a moderate level of wear upon the occlusal surface, on which a thin rim of enamel was present about the margin. Dentine covered much of the incisal margin, and a small spot of secondary dentine was present in the center of the occlusal surface. Full eruption and this degree of occlusal attrition to this tooth suggest that this individual was at least nine years of age at the time of death (Ubelaker 1978).

Mesiodistal crown length was 4.5 mm, and labiolingual breadth was 4.6 mm. Morphological observations on mandibular incisors are few, but the degree of lingual shoveling represented on this tooth corresponds to Grade 3 in the standardized system of Turner (n.d.). No dental caries or linear enamel hypoplastic defects were observed.

In summary, human skeletal remains found during the 1989 investigations at Yaquina Head were all isolated elements; no articulated human burials were encountered. The remains included elements from at least three individuals: (1) a juvenile represented by a right radius, and (2) an adult represented by the metatarsal and scapula, both found in Area A; and (3) the incisor of a sub-adult found in Area B. Together with the two burials found during the 1986 investigations, a total of five individuals are now known to have been buried at 35LNC62.

While the human skeletal remains found during the 1989 investigations provide little new osteological information about the native inhabitants, their recovery does suggest that additional human burials are present at 35LNC62. After consultation with the Confederated Tribes of Siletz Indians, the four human remains found during the 1989 investigations were reinterred on Yaquina Head near their original recovery locations.

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CHAPTER 7

DESCRIPTION OF ARTIFACTS

by Rick Minor and Robert R. Musil

The artifacts recovered during the 1989 investigations at Yaquina Head include objects made from stone, bone/antler, and shell. These artifacts were classified in terms of the same typology used to describe the collection obtained during the previous investigations at the headland in 1986 (Minor and Musil 1987). Based on the raw materials and the nature of modification, the artifacts were assigned to one of six series. The stone artifacts, which comprise the bulk of the artifact assemblage, are divided into four series: (1) flake tools, (2) cobble tools, (3) cores and debitage, and (4) abraders. Two other stone artifacts not assignable to one of these four series are described as "lithic oddments." The remainder of the artifact assemblage includes the bone/antler series and the shell series.

The artifacts from Yaquina Head were catalogued using a simple system that indicates in which 1 x 1 m unit, 10 cm level, and depositional stratum each specimen was recovered. According to this system, the unit number is followed by the level number, the stratum number, and a serial number which consecutively records each artifact within that particular unit, level, and stratum. Thus, projectile point 29-11/3-1 was the first artifact from Level 11 of Stratum 3 in Unit 29. Feature associations are also indicated in the catalogue numbers where appropriate. The classes of artifacts, their frequency, and their distribution by site area and strata are summarized in Table 7-1.

FLAKE TOOL SERIES

A total of 28 flaked stone tools were recovered during the 1989 excavations. The flaked stone tool category includes artifacts that were formed by bifacial or unifacial modification, as well as flakes that exhibit use-wear without evidence of purposeful retouch. Metric attributes of the flaked stone tools are presented in Table 7-2.

Four of the flaked stone tools are made from obsidian, two from basalt, and the remaining 22 from chert. The obsidian artifacts are small and, with the exception of a single projectile point preform, are finished tools. Obsidian is only sparsely represented in most Oregon coast sites. Although this material occurs as pebbles in the float gravels of the Siuslaw River (Skinner 1983:45), it is likely that most

Table 7-1. Inventory of artifacts recovered in 1989 from Yaquina Head.

	Area A/Stratum			Area B/Stratum			Area C	Auger	Column	
Artifact Class	1	2	3	1	2	3	1	Holes	Samples	TOTAL
Flake Tool Series										
Projectile Points	2	-	1	-	-	-	-	-	-	3
Preform	-	-	-	1	-	-	-	-	-	1
Drills	2	-	-	-	-	-	-	-	-	2
Perforator	-	-	-	-	1	-	-	-	-	1
Knife	1	-	-	-	-	-	-	-	-	1
Bifaces	-	-	3	-	1	-	-	-	-	4
Scraper	-	-	-	-	1	-	-	-	-	1
Gravers	2	-	1	-	-	-	-	-	-	3
Used Flakes	2	1	4	5	-	-	-	-	-	12
Cobble Tool Series										
Hammers	1	1	10		1	-	-	1	-	14
Choppers	-	-	1	-	2	-	-	-	-	3
Stone Wedge	1	-	-	-	-	-	-	-	-	1
Used Cobble Flakes	1	3	-	1	1	-	-	1	-	7
Core/Debitage Series										
Cores	6	4	4	3	3	-	-	-	-	20
Debitage	909	255	370	380	250	70	12	32	7	2285
Manuport	1	-	-	-	-	-		-	-	1
Abrader Series										
Sandstone	3	4	7	-	5	-	-	-	-	19
Siltstone	-	1	-	-	-	-	-	-	-	1
Lithic Oddments										
Lignite Cobble	-	-	-	-	1	-	-	-	-	1
Mudstone Spheriod	1	-	-	-	-	-	-	-	-	1
Bone/Antler Series										
Harpoon Dart Head Fragments	-	2	-	-	3	-	-	-	-	5
Split Bone Awls	-	6	-	-	4	-	-	-	-	10
Bone Wedges	-	-	2	-	1	-	-	-	-	3
Bone Chisels	-	1	-	-	2	-	-	-	-	3
Bone Flaker	-	-	-	-	1	-	-	-	-	1
Fish Gorge?	-	-	-	-	1	-	-	-	-	1
Bone Whistles	-	-	-	-	2	-	-	-	-	2
Bone Tube Bead	-	-	-	-	1	-	-	-	-	1
Decorated Bone	-	-	-	-	2	-	-	-	-	2
Worked Bone	3	4	-	1	18	-	-	1	-	27
Antler Spatulates	-	-	-	1	2	-	-	-	-	3
Antler Beam Wedges	-	1	-	-	3	-	-	-	-	4
Antler Tine Wedge	1	-	-	-	-	-	-	-	-	1
Antler Pendant	-	-	1	-	-	-	-	-	-	1
Antler Figurine	-	-	1	-	-	-	-	-	-	1
Antler Flesher	-	-	-	-	1	-	-	-	-	1
Used Antler Tines	1	1	-	-	2	-	-	-	-	4
Antler Sleeve Haft	1	-	-	-	-	-	-	-	-	1
Worked Antler	-	1	-	-	3	-	-	-	-	4
Shell Series										
Olivella Beads	-	6	-	-	2	-	-	-	-	8
Dentalium	-	-	-	-	1	-	-	-	-	1
Bead/Pendant Fragment	-	-	-	-	1	-	-	-	-	1
Ground Mussel Shell	-	2	-	-	1	-	-	-	-	3

obsidian found in Oregon coast sites was obtained from sources to the east in the upper Willamette Valley and mountains of the Cascade Range.

In contrast, the basalt and chert tools found at Yaquina Head are not as finely made and undoubtedly represent the on-site reduction of locally available chert nodules and basalt cobbles. This situation is reflected in the extensive evidence for core reduction of local chert and basalt material at the site.

Projectile Points

Two classifiable projectile points and the base or stem from a third specimen were found. The first point is a small lozenge-shaped obsidian specimen (29-11/3-1). Both the distal and proximal tips are broken. The piece exhibits fine controlled flaking across both faces (Figure 7-1a).

The second point is a crudely flaked side-notched chert specimen (22-9/1-1). The point exhibits large irregular flake scars on both faces of the blade section, which is convex in shape and only slightly pointed (Figure 7-1b). Large shallow side-notches have been added, but the base still retains the squared edge of the flake blank. The piece appears to be still in the reduction stage, but due to the addition of side-notches it has been classified as a projectile point. The neck-width measures 15 mm, and the base width is 17.9 mm.

The base or stem fragment (41-7/1-1) from an obsidian projectile point exhibits controlled basal thinning scars and a wedge-shaped cross-section. The piece was broken with a perverse fracture, apparently below the notches. The piece measures 12.5 mm across the base and is 4.1 mm thick.

Preform

The single obsidian projectile point preform (9-4/1-1) recovered was made on a thin interior flake with the original detachment scar still visible on one face of the flake blank and a remnant dorsal scar visible on the other face (Figure 7-1c). The distal portion of the flake blank has been shaped to a point and thinned across most of the blade section, but the proximal end retains the original flake blank scars and exhibits only initial edging on the squared edges. The original flake blank was thin and only shaping and secondary thinning were needed to reduce the preform to its present stage of manufacture.

Drills

Two artifacts classified as drills were recovered. A small obsidian drill (33-8/1-1) is made of gray opaque obsidian (Figure 7-1d).

This material is unlike the black translucent obsidian of the debitage and other bifacial tools recovered during the 1989 excavations. The specimen is narrow with a thick cross-section. The extreme distal tip is broken off, but otherwise the piece is complete. The blade section exhibits fine controlled pressure flaking along its length. The drill has two shallow side notches above an expanding convex base. The piece exhibits basal thinning parallel to the long axis of the tool. The neck-width of this drill measures 7.6 mm, and the base width is 10.6 mm.

The second drill (32-13/1-1) is represented by a basalt mid-section fragment (Figure 7-1e). The fragment is thick in cross-section, but is flaked completely across both faces. The blade edges are

Table 7-2. Dimensions of flaked stone tools.

		Measurements			
Artifact Class	Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Projectile Points	29-11/3-1*	29.1	18.3	6.3	3.17
	22-9/1-1	30.5	25.0	6.5	4.79
Preform	9-4/1-1*	43.6	17.8	5.0	3.10
Drills	32-13/1-1+	53.8	34.5	15.9	25.50
	33-8/1-1*	27.9	9.8	6.0	1.53
Perforator	10-4/2-7	26.2	17.4	6.5	2.90
Knife	36-8/1-1	67.8	37.5	11.1	28.94
Bifaces	8-9/2-F2-1	61.7	38.7	17.3	34.36
	31-11/3-2	54.3	27.7	11.7	15.56
	31-12/3-F15-1	84.7	40.8	20.1	63.81
	40-14/3-F15-1	56.6	30.1	13.0	20.10
Scraper	13-6/2-1	26.9	24.0	8.1	4.63
Gravers	38-15/3-F15-1	66.0	51.7	17.2	72.48
	40-13/1-1	42.2	24.0	19.4	17.93
	43-5/1-1	41.5	100.2	13.2	52.50
Used Flakes	3-12/1-1+	27.7	28.6	6.0	5.96
	8-4/1-1	32.2	18.2	7.2	2.92
	11-4/1-F3-3	37.8	22.8	7.6	4.03
	13-4/1-1	42.2	26.3	9.3	10.27
	14-4/1-1	61.3	44.8	17.3	49.70
	21-13/3-1	21.8	14.3	4.5	1.44
	22-9/1-3	38.3	20.4	4.7	4.69
	24-7/2-2	47.0	35.8	13.3	13.18
	31-9/3-1	44.4	33.5	11.4	10.28
	34-15/3-1	20.1	21.1	3.6	1.20
	34-15/3-F15-1	22.7	31.6	6.2	3.35
	35-11/1-1	31.9	24.2	7.0	4.64

Note: All items are chert unless otherwise noted; obsidian (*), basalt (+). Not included is an obsidian projectile point base fragment (41-7/1-1) too small to yield meaningful measurements.

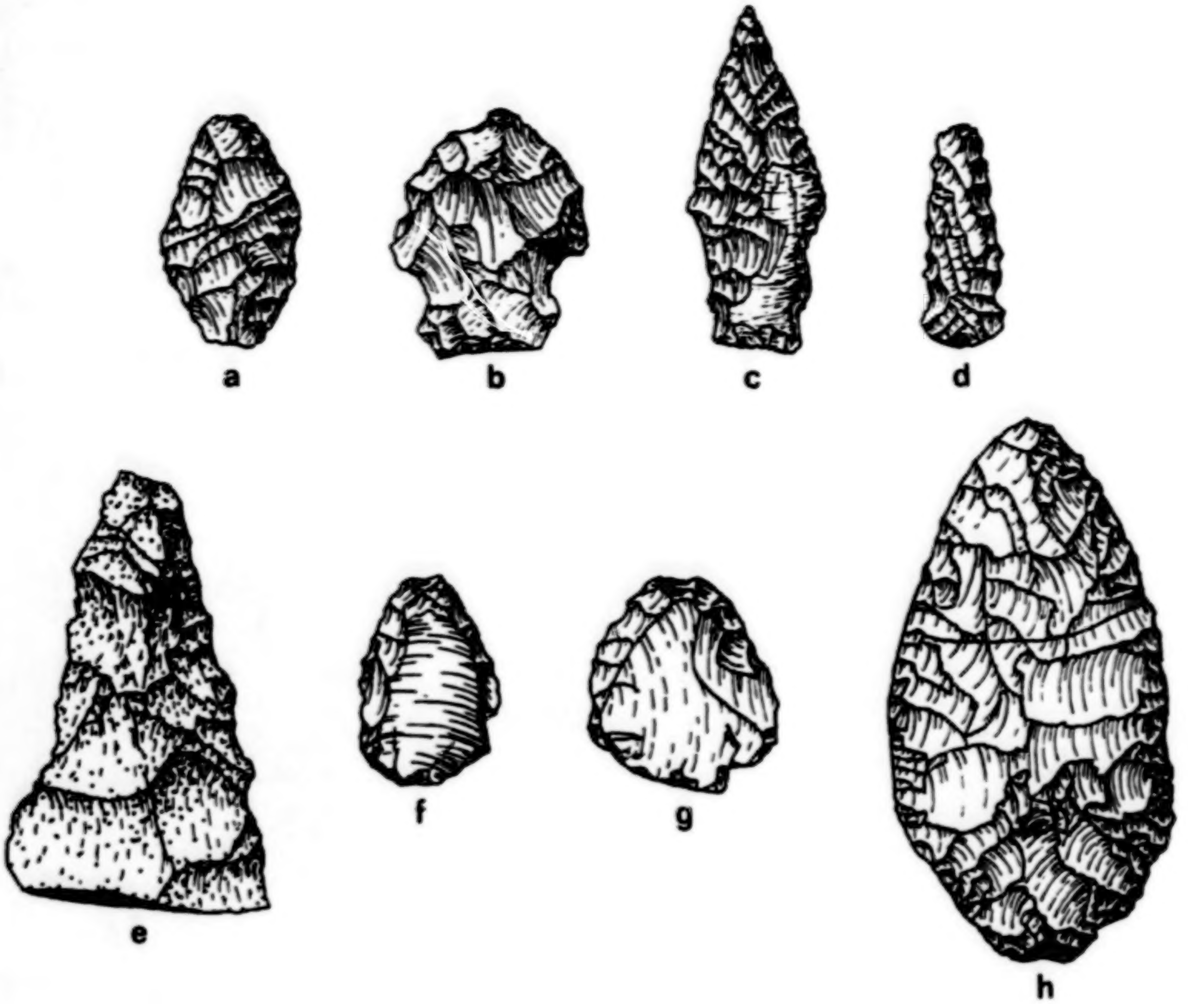

Figure 7-1. Chipped stone tools: a-b, projectile points; c, preform; d-e, drills; f, perforator; g, scraper; h, knife (shown actual size).

a. 29-11/3-1
b. 22-9/1-1
c. 9-4/1-1
d. 33-8/1-1
e. 32-13/1-1
f. 10-4/2-7
g. 13-6/2-1
h. 36-8/1-1

sinuous with deep and wide flake scars. The very distal tip is broken off and the piece appears to have been broken by a bend fracture across the midsection of the blade. Because of the greater strength of basalt, this piece would have been suitable for heavy-duty drilling activities.

Perforator

A single artifact classified as a perforator (10-4/2-7) consists of a small complete chert flake modified by bifacial retouch along the lateral margins (Figure 7-1f). This flaking pattern created a point, now missing, on the distal end. This point was probably not strong enough to use in a circular drill-like motion, but instead was probably suitable for lighter tasks involving perforating or incising. The proximal (striking platform) end of the flake on which this artifact was made still retains cortex.

Scraper

Only one artifact (13/6-2-1) exhibits a continuous unifacially retouched edge consistent with the definition of a scraper. Unifacial retouch has been applied to the lateral margins and the distal end of a small complete chert flake (Figure 7-1g). This flaking pattern has resulted in a convex shape on the distal end of the flake. The proximal (striking platform) end of the flake still retains cortex.

Knife

The finest flaked stone artifact found at the site is a large chert bifacial knife (36-8/1-1). The piece was made from a flake blank, the platform of which remains at the proximal end of the biface. A small remnant of the original detachment scar is also present on one side of the piece. This specimen exhibits fine controlled flaking across the dorsal surface of the flake blank, with small pressure retouch along the margins (Figure 7-1h). The ventral side of the flake blank also exhibits fine controlled flaking, but it does not cover the entire surface of the biface. The edges are not regularized and are slightly sinuous, and a remnant of a squared edge occurs near the distal tip. While functional as a knife, the attributes listed above indicate that technologically this specimen is an example of the later stages (secondary thinning and pressure retouch) of bifacial tool manufacture (Callahan 1979).

Bifaces

Four chert bifaces were recovered during the 1989 excavations. Three are flake blanks that exhibit uneven bifacial flaking along the flake margins (Figure 7-2,a-b). These flake blanks exhibit attributes similar to those described for the initial edging stage of biface reduction (Callahan 1979).

One of these bifaces (8-9/2-F2-1) exhibits evidence of use-wear along one bifacially-flaked margin (Figure 7-2c). This tool is similar to the specimens classified as flake knives in the 1986 report (Minor and Musil 1986:87).

The fourth biface (31/12-3-F15-1) also exhibits flaking only on the flake margins, but the piece has been shaped to a point on the distal tip (Figure 7-2d). The specimen is made from very poor material

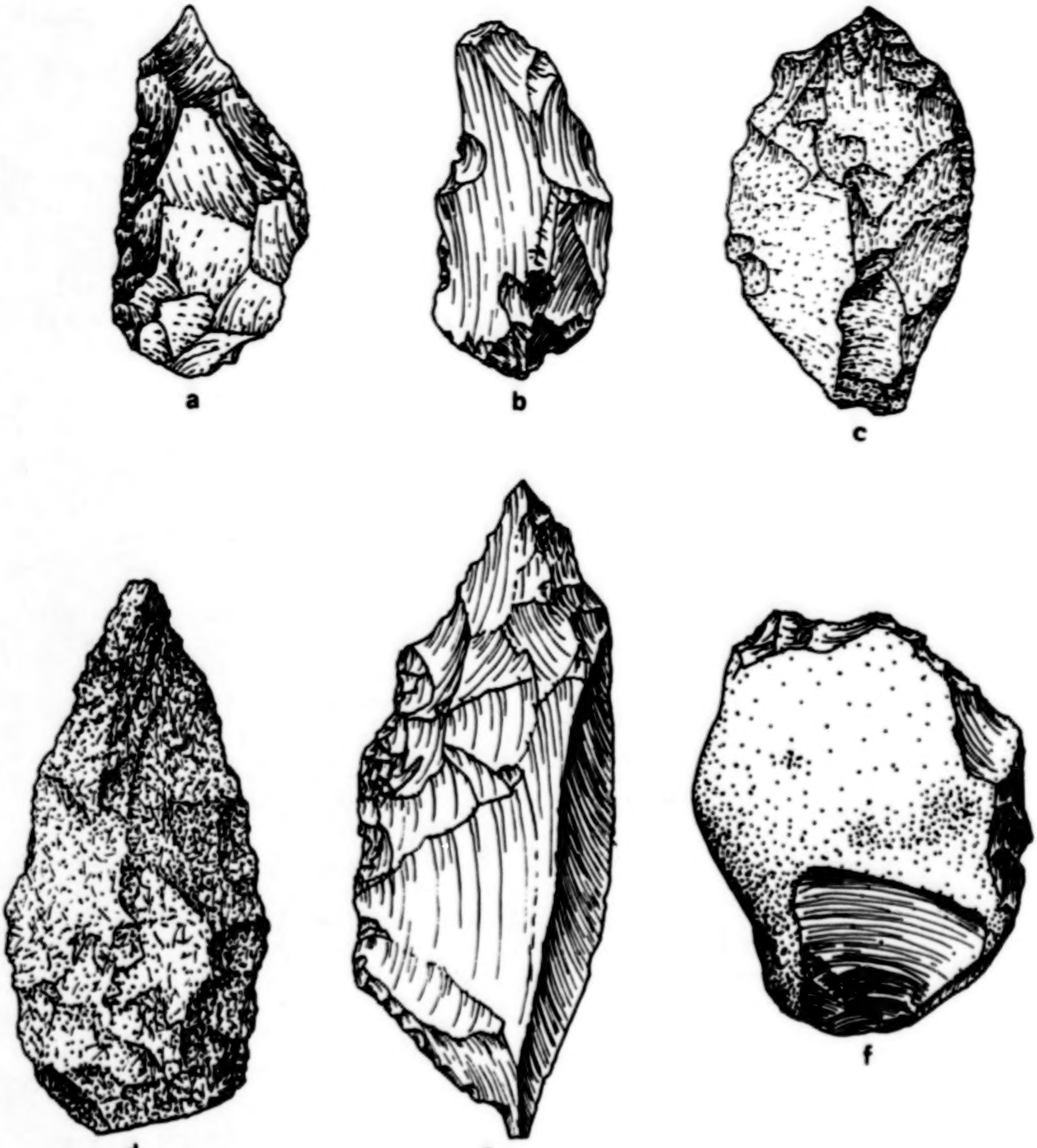

Figure 7-2. Bifaces and gravers: a-d, bifaces; e-f, gravers (shown actual size).

a. 40-14/3-F15-1
b. 31-11/3-2
c. 8-9/2-F2-1
d. 31-12/3-F15-1
e. 43-5/1-1
f. 38-15/3-F15-1

and the flake scars are deep and irregular, terminating in steep jagged step fractures.

Gravers

Three artifacts featuring spurs or projections suitable for graving or incising purposes were recovered. The first specimen (43-5/1-1) is a large chert flake with cortex remaining on the platform. Two pointed spurs have been produced on the lateral ends of the flake by unifacial retouch. This piece also shows evidence of use for casual cutting or scraping purposes along one lateral flake margin (Figure 7-2e).

The second specimen (38-15/3-F15-1) is a large chert flake removed from the outside of a nodule. The dorsal side is completely covered by cortex except for the distal end, where retouch has produced a unifacial edge and a single flake scar near the platform. Two sharp projections have been flaked into the unifacial edge (Figure 7-2f). This graver was found in association with the antler figurine and pendant on the living surface in Area A (Feature 15).

The third specimen (40-13/1-1) is a piece of angular chert debris retaining some cortex. Retouch along one edge has produced a steep unifacial edge along which three graver spurs occur. This specimen thus appears to have been a combination tool suitable for both scraping and graving activities.

Used Flakes

Twelve flakes that exhibit evidence of casual use, but not purposeful retouch, along an edge were recovered from the excavations. Eleven are chert flakes or flake fragments and the other is a basalt flake fragment. Eight of the used flakes still retain cortex, five are flake fragments, and seven are complete flakes.

COBBLE TOOL SERIES

A total of 25 artifacts assigned to the cobble tool series were recovered during the 1989 investigations at Yaquina Head. As the name implies, this series consists of artifacts made of or directly derived from cobbles. Included are implements made by means of flaked stone technology as well as tools characterized by simple battering or use-wear. Although some functional overlap may have existed with artifacts of the flake tool series, the implements assigned to the cobble tool series are larger and heavier, and clearly reflect a more heavy-duty use than was the case with their smaller counterparts.

Table 7-3. Dimensions of measurable cobble tools.

		Measurements			
Artifact Class	Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Hammers	9-9/2c-1	6.9	5.9	3.1	209.7
	24-10/2-1	7.7	6.9	2.7	247.5
	26-15/3-1	5.5	4.1	2.2	76.7
	31-12/3-F15-2	7.6	6.8	3.8	311.1
	36-11/3-1	9.2	7.1	3.3	358.5
	37-15/3-1	7.1	7.0	3.4	254.9
	38-11/1-1	5.1	4.2	2.5	85.2
	41-15/3-F18-2	9.7	7.3	4.4	496.9
	AH-F2-10-1	4.8	4.3	2.3	73.0
Choppers	7-7/1-1	9.9	8.4	3.2	355.5
	16-10/1-1	10.5	8.7	4.0	558.1
Stone Wedge	27-13/1-1	12.7	5.2	4.4	372.5
Used Cobble Flakes	6-4/1-1	8.9	6.8	2.5	152.8
	10-4/2-6	4.6	4.7	1.3	28.2
	19-10/2c-1	7.5	6.7	1.6	81.8
	19-10/2c-F13-1	8.1	5.7	1.9	108.0
	23-7/2-F7-1	6.8	5.1	1.7	68.3
	36-10/1-1	7.8	6.1	2.8	139.3
	AH-F6-10-1	9.5	5.2	2.5	115.7

The cobble tools recovered from Yaquina Head are all made from basalt pebbles or cobbles. As previously mentioned, these materials are abundantly available on the beach below the headland. Most of the cobble tools appear to have been made from cobbles obtained from this source. The dimensions of the measurable cobble tools recovered during the 1989 investigations are shown in Table 7-3.

Hammers

Fourteen implements exhibiting evidence of use as hammers were recovered. Six are cobble-size implements (>6.7 cm), and three are pebble-size tools (<6.7 cm). The remaining five hammers are fragmentary, but were probably also cobble-size before breakage. Most of the hammers, including the fragmentary specimens, are ovoid in shape. On most specimens evidence of battering is concentrated along the edges (Figure 7-3,a-c), but one specimen (41-15/3-F18-2) features pecking and charcoal staining on the top (Figure 7-3d).

Choppers

Two complete cobble choppers and a fragment of a third were recovered. All three implements are basalt cobbles from which flakes

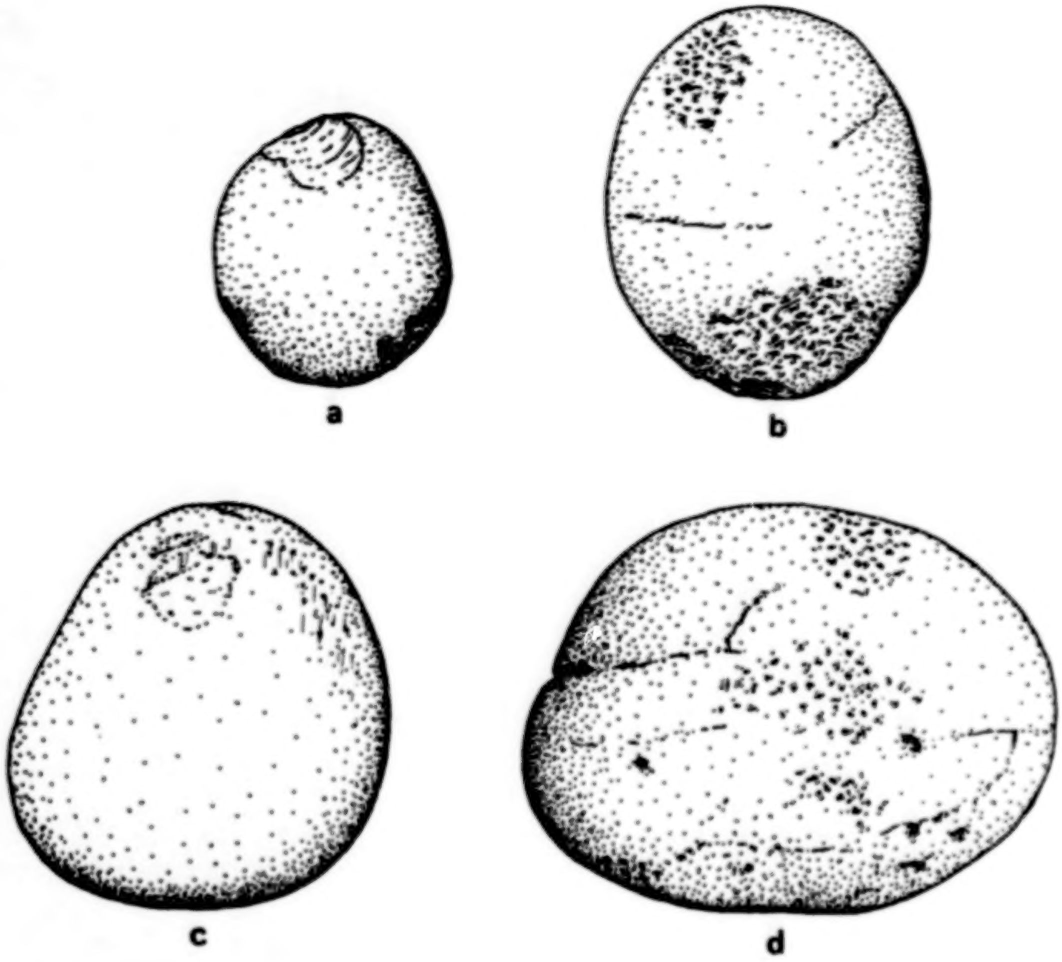

Figure 7-3. Basalt cobbles used as hammers: a, pebble-size; b-d, cobble-size (shown 70% actual size).

a. AH-F2-10-1 b. 9-9/2c-1 c. 37-15/3-1 d. 41-15/3-F18-2

were struck to form bifacial edges suitable for chopping or cutting (Figure 7-4a,b).

Stone Wedge

One artifact (27-13/1-1) was recovered that appears to have functioned as a stone wedge. This specimen is an elongate basalt cobble with a bifacially-formed bit on one end and evidence of battering on the blocky other end (Figure 7-4c). This implement was probably used in the same way that bone and antler wedges were employed in heavy-duty woodworking activities.

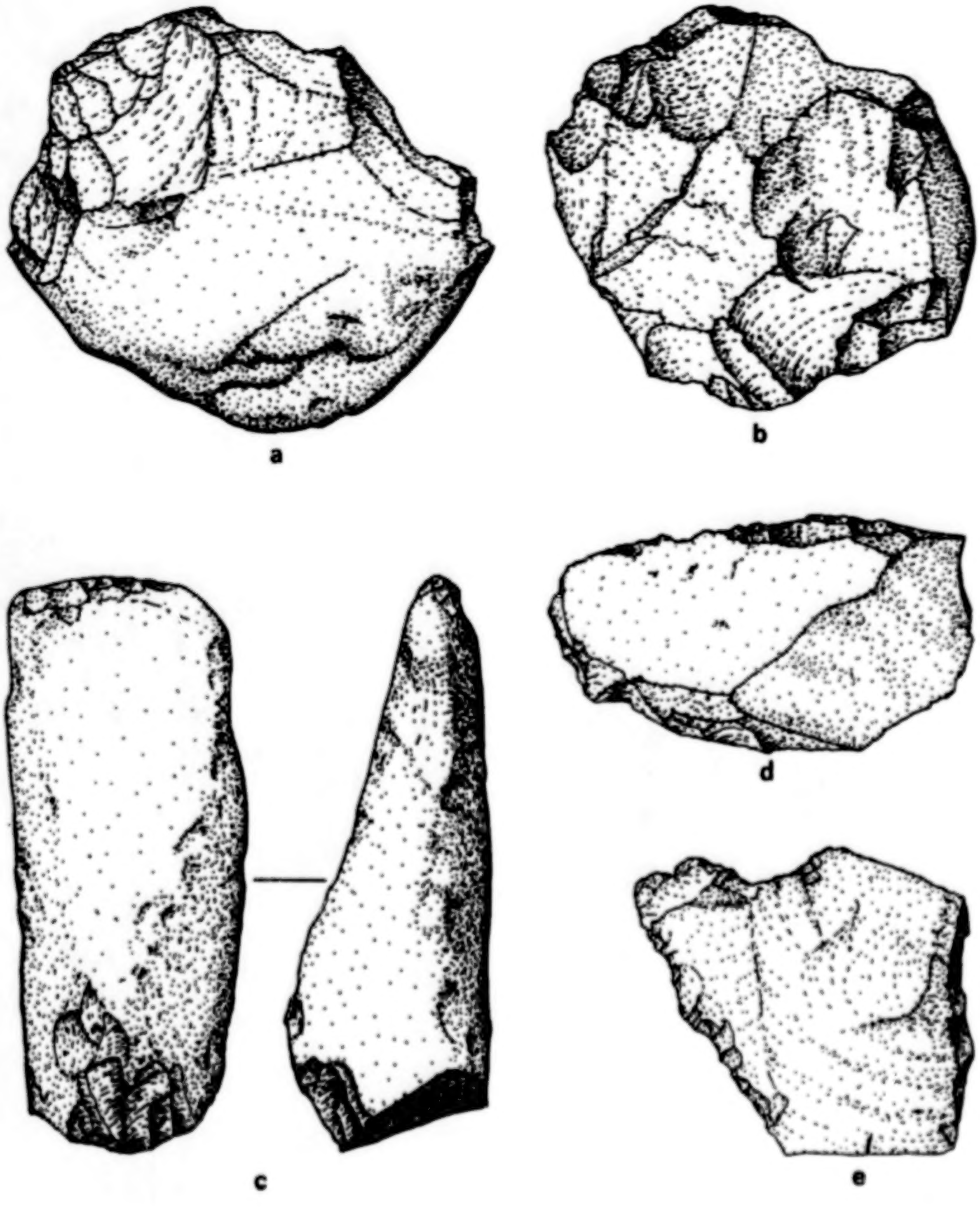

Figure 7-4. Cobble tools: a-b, choppers; c, stone wedge; d-e, used cobble flakes (shown 70% actual size).

a. 16-10/1-1 c. 27-13/1-1 d. AH-F6-10-1
b. 7-7/1-1 e. 19-10/2c-F13-1

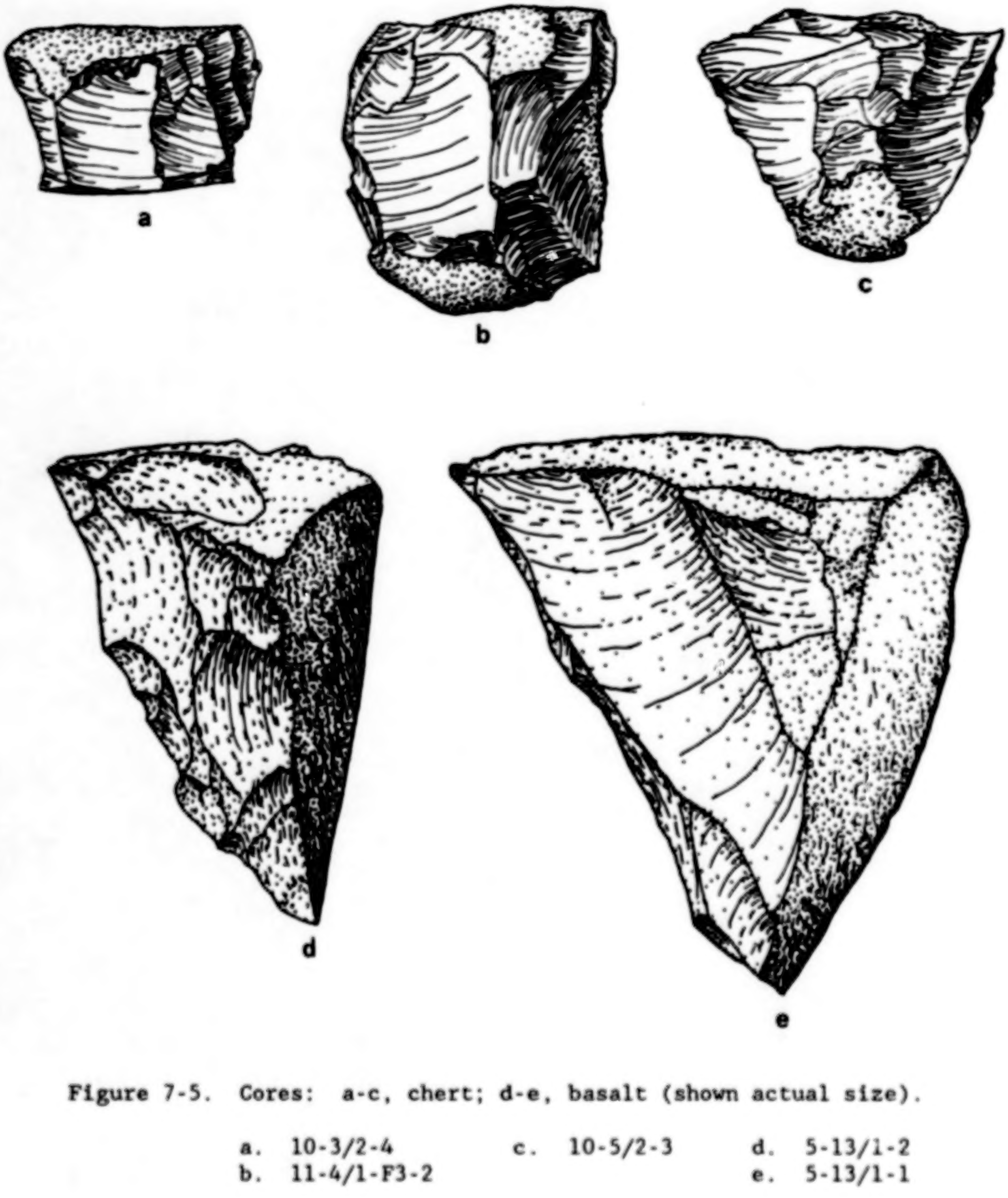

Figure 7-5. Cores: a-c, chert; d-e, basalt (shown actual size).

a. 10-3/2-4
b. 11-4/1-F3-2
c. 10-5/2-3
d. 5-13/1-2
e. 5-13/1-1

Used Cobble Flakes

Seven flakes struck from large basalt cobbles show evidence of use as cutting, scraping, or graving tools. All of the specimens retain some cortex. Evidence of modification on these tools is limited to minimal flake removals to create sharp edges and use-wear (Figure 7-4,d-e).

CORE AND DEBITAGE SERIES

This series consists of the artifacts and waste products resulting from the flake stone tool manufacturing process. Reduction of the locally available chert and basalt cobbles represented a major activity at Yaquina Head. The types of cores and debitage recovered during the 1986 and 1989 investigations reflect a lithic reduction strategy oriented to intensive core reduction, as only minor evidence for biface reduction was obtained.

Cores

Twenty cores were recovered during the 1989 excavations. Sixteen of the cores are of chert and four are of basalt. The majority of both the chert and basalt cores are irregular chunks of lithic material that have been flaked in an unsystematic manner by direct freehand percussion. The dimensions of the cores recovered in 1989 from Yaquina Head are listed in Table 7-4.

Three small chert cores exhibit well controlled unidirectional and bidirectional flake removals around a flat cortex-covered striking surface (Figure 7-5,a-c). At the other end of the scale, three of the larger basalt cores are little more than natural cobble fragments with fewer than five flake removals (Figure 7-5,d-e). The remaining cores are angular chunks or split cobbles that exhibit multidirectional flaking over some portion of the core surface. The flakes produced from split cobbles and smaller multidirectional cores tend to retain cortex on their striking platforms (see description of debitage below).

Debitage

A total of 2285 pieces of lithic debitage was collected during the 1989 excavations at Yaquina Head. Of this total, 32 pieces were recovered from the auger hole testing, 7 from the column samples, and 2246 were collected from the unit excavations. The debitage from the 1989 excavations is dominated by 1693 pieces of chert (74.1%). Basalt debitage includes 552 pieces (24.2%), while obsidian is represented by only 27 pieces (1.2%). Two pieces of petrified wood and 11 pieces of other stone (items in this category appear to be a blocky quartz material) account for the remainder of the debitage recovered.

Table 7-4. Dimensions of cores.

Specimen No.	Measurements Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Material
5-13/1-1	87.2	77.0	67.8	455.0	basalt
5-13/1-2	80.7	67.8	47.2	174.9	basalt
10-3/2-3	26.3	29.1	14.6	12.8	chert
10-3/2-4	42.0	23.8	26.3	34.4	chert
10-5/2-3	59.1	50.5	39.2	101.8	chert
11-4/1-F3-2	47.2	43.0	28.9	69.2	chert
20-9/1-3	103.1	80.9	82.0	776.9	chert
21-9/2-1	66.0	67.4	35.3	140.4	chert
21-12/3-1	99.8	81.9	42.8	332.2	chert
21-12/3-2	39.3	37.2	32.9	68.9	chert
22-9/1-2	29.0	18.1	19.3	5.8	chert
24-11/2-1	30.1	24.2	10.1	8.0	chert
25-11/1-1	56.6	37.3	37.9	75.9	chert
27-11/1-1	46.3	23.4	30.4	50.3	chert
29-11/3-2	67.0	53.1	41.2	181.7	basalt
32-9/1-2	70.3	54.7	28.2	121.1	chert
34-16/3-F15-1	136.0	110.6	71.1	1712.0	basalt
38-14/2-1	128.2	98.4	111.2	1447.3	chert
39-9/1-1	50.2	40.5	19.3	32.8	chert
39-11/2-1	63.3	32.7	28.2	42.7	chert

As previously noted, the predominance of chert and basalt at the site is clearly due to their local availability. Basalt cobbles are abundant on the beach below the headland, and were brought up to use in rock oven features associated with processing shellfish. Smaller chert cobbles are available on Agate Beach just south of Yaquina Head. In contrast, obsidian in sufficient size for stone tool manufacture is not known to occur along the Oregon coast. While obsidian pebbles have been reported as float gravels in the Siuslaw River (Skinner 1983:85), the closest known sources for artifact-quality obsidian are located some distance to the east in the Upper Willamette Valley and Cascade Range.

Manuport

A tabular piece of chert (38-9-12/1-F6-1) is classified as a manuport, as it was apparently brought to the site as raw material for flaked stone tool manufacture. The specimen is covered by cortex except where it has been broken along one side. This piece was probably originally ovoid in form, measuring in the neighborhood of 7.5-8.5 cm in diameter and 1.1 cm thick.

ABRADER SERIES

Twenty implements exhibiting signs of abrasive wear were recovered. Nineteen sandstone abraders were found, all but three of which are fragmentary. The three complete specimens are oval in form (Figure 7-6a). The largest measures 12.0 x 10.9 x 2.4 cm and weighs 343.5 g; the smallest measures 10.2 x 10.0 x 2.8 cm and weighs 381.7 g. Of the fragments, five appear to be from oval pieces of sandstone, while the remaining 11 specimens appear to be fragments of rectangular abraders (Figure 7-6,b-c). The only non-sandstone abrader recovered is a tabular piece of siltstone (43-6/2-F4-1) that has been shaped by abrasion along the two longer edges (Figure 7-6d). This specimen measures 9.4 cm in length, 9.2 cm in width, 1.3 cm in thickness, and weighs 92.0 g. The abraders found at Yaquina Head were presumably used in the manufacture or maintenance of bone, antler, or shell tools at the site.

LITHIC ODDMENTS

Two additional implements recovered at Yaquina Head do not easily fit into any of the previously described artifact series. The first specimen (7-7/2-1) is a shiny black lignite cobble. Lignite is a soft, easily-worked lithic material that was sometimes used by prehistoric Northwest Coast peoples to make lip plugs (Don E. Dumond, personal communication, 1990). This specimen exhibits a few scratches on one face, but is otherwise unmodified (Figure 7-6e). It measures 8.1 cm in length, 5.3 cm in width, 2.1 cm in thickness, and weighs 75.1 g.

The second specimen is a fragmentary mudstone pebble (20-9/1-4) that appears to have been shaped into a spheroidal form (Figure 7-6f). Peck marks occur in the center on both sides of the object. Only length and thickness measurements are obtainable. This specimen measures 5.0 cm in length and 1.9 cm in thickness. This piece is similar to spheroidal "clay" artifacts reported from Tahkenitch Landing on the south-central Oregon coast (Minor and Toepel 1986:84-87).

BONE/ANTLER SERIES

A total of 75 bone and antler artifacts was recovered in 1989 from Yaquina Head. Where identifiable, most of these artifacts appear to have been made from skeletal elements of large terrestrial mammals such as deer and elk, but artifacts made from bird bone are also represented.

Harpoon Dart Head Fragments

Five pieces of large mammal bone or antler are tentatively identified as fragments of harpoon dart heads. One piece (12-7/2-1) may be

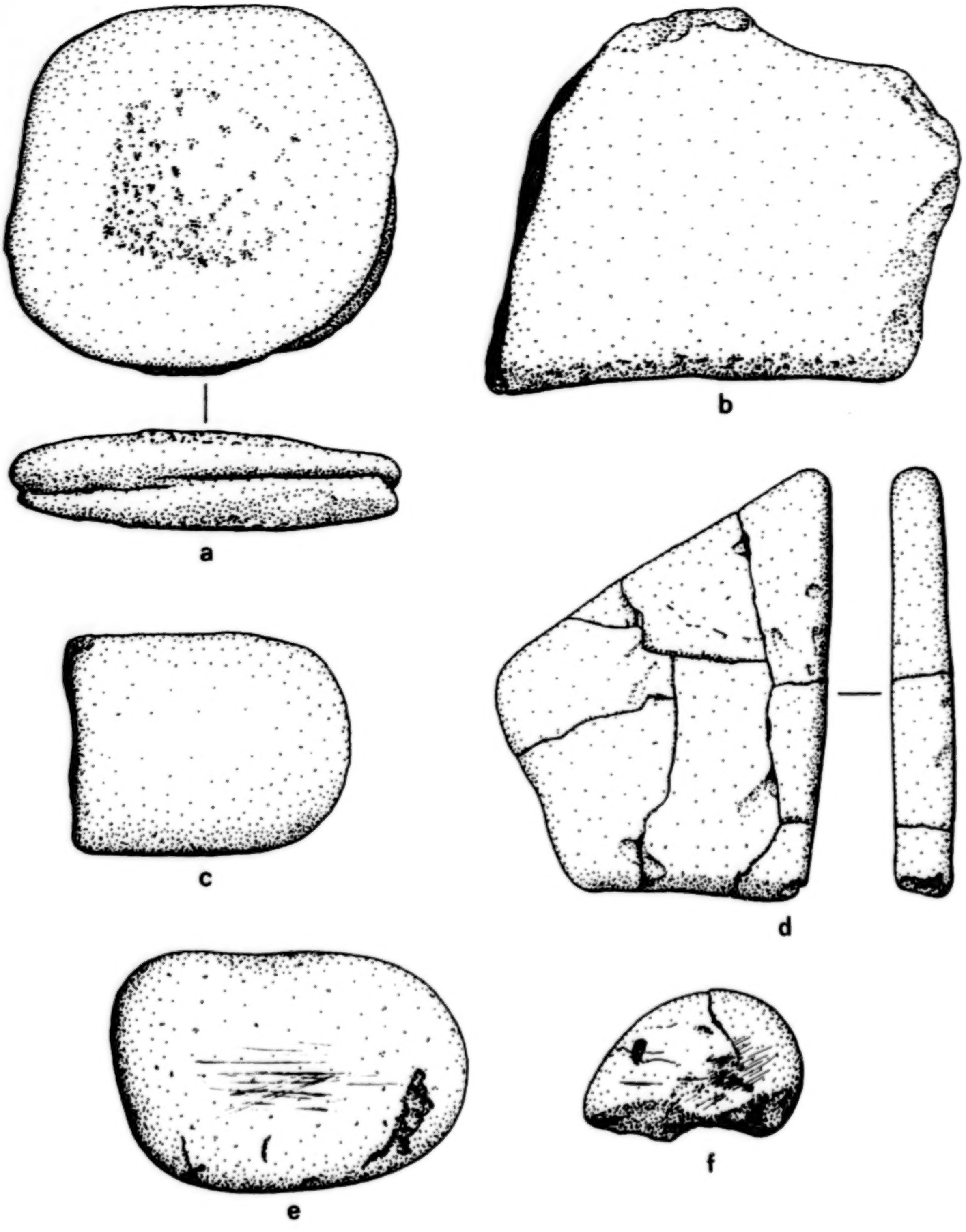

Figure 7-6. Abraders and lithic oddments: a-c, sandstone abraders; d, siltstone abrader; e, black lignite cobble; f, mudstone pebble (shown 70% actual size).

a. 4-15/3-F18-1
b. 30-12/3-F15-1
c. 24-9/2-1
d. 43-6/2-F4-1
e. 7-7/2-1
f. 20-9/1-4

the rounded basal fragment of a barbed harpoon point (Figure 7-7a). A second piece (10/5/2-2) with an outwardly curving point may be a barb fragment from a barbed harpoon point (Figure 7-7b). The third piece (11-6/2-1), considerably thicker in cross-section than the others, may be the tip fragment of a harpoon dart point (Figure 7-7c). Identification of the other two pieces (43-9/2-1, 24-7/2-1) is less secure, but both are of the size and shape to suggest that they may also be harpoon dart point tip fragments (Figure 7-7,d-e).

Split Bone Awls

Ten bone splinters feature sharpened tips polished from use-wear indicating use as awls (Figure 7-7,f-h). These include four specimens made from deer-size long bone shafts, three specimens made from medium or large mammal long bone shafts, and three specimens made from medium or large bird long bone shafts.

Bone Flaker

A fragmentary section of large mammal bone with a sharpened tip (14-6/2-1) may have been used as a flaker in the manufacture of chipped stone tools. Flake scars extending back from the tip on three sides indicate use in a pressing or prying motion (Figure 7-7i).

Fish Gorge

A fragmentary pointed bone object (8-6/2-1) is tentatively identified as a fish gorge (Figure 7-7j). This specimen features a sharp pencil-like tip on the intact end, and a marked constriction that may have served for attachment of a line. This constriction, formed by chipping flakes from two opposing faces, is now at the broken end of the specimen.

Bone Chisels

Three tools with narrow bits are classified as chisels (Figure 7-8,a-c). One specimen (42-11/2-1) was made from a deer metapodial shaft, the second (8-8/2-1) from a large mammal (probably elk) long bone shaft, and the third (12-4/2-F3-1) from a large mammal long bone.

Bone Wedges

Three tools derived from split long bones and featuring broad bits are classified as wedges. One relatively complete specimen (39-9/2-1) was made from the proximal end of an elk metapodial. The remaining two specimens are bit fragments also made from large mammal long bones.

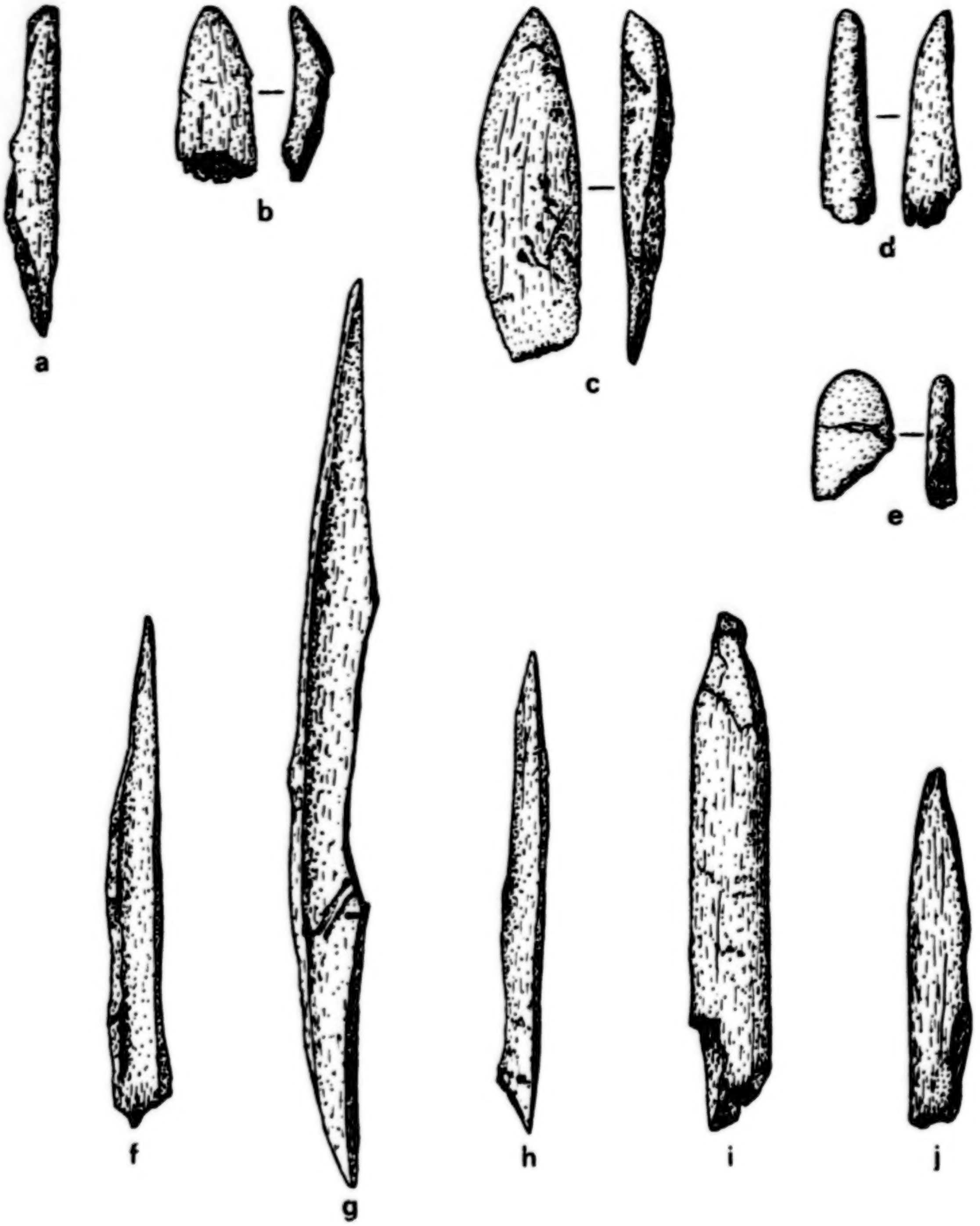

Figure 7-7. Bone artifacts: a-e, harpoon dart head fragments; f-h, split bone awls; i, flaker; j, fish gorge (shown actual size).

a. 12-7/2-1
b. 10-5/2-2
c. 11-6/2-1
d. 24-7/2-1
e. 43-9/2-1
f. 39-12/2-1
g. 8-5/2-1
h. 23-8/2-1
i. 14-6/2-1
j. 8-6/2-1

Bone Whistles

Two hollow sections of bird bone exhibit intentionally-made embouchure holes suggesting use as whistles. The complete specimen (11-6/2-3), made from a bird ulna, is 7.0 cm in length and 0.5 cm in diameter and features one hole (Figure 7-11a). The fragmentary specimen (14-7/2-3), made from a bird long bone, is also 0.5 cm in diameter. This specimen is broken across the embouchure hole.

Bone Tube Bead

A section of hollow bird bone (13-6/2-1) with cut ends may have been a bead. This specimen measures 0.6 cm in length and 0.4 cm in diameter.

Decorated Bone

Two fragmentary bones exhibiting decorations were recovered. The first, identified as a beaver baculum (13-5/2-1), features incised lines (Figure 7-11b). The second, identified as the right tibia of a bobcat (8-7/2-1), features 26 short cut marks on one side (Figure 7-11c); it is sometimes speculated that such marks ("tally marks") represent evidence of counting.

Worked Bone

Twenty-seven pieces of bone worked by means of cutting, abrasion, or polishing cannot be classified as to function or original form. Included are two elk metapodial fragments and three other elk-size and one deer-size long bone shaft fragments that have been worked. Two of these pieces have been extensively battered and may represent worn out wedges. A single rib from a large mammal was recovered that was shaped and polished. Another five pieces are identifiable only as fragments of bone from large mammals, and two more are simply amorphous bone fragments. The remaining worked pieces consist of 13 bird bones. Three are identifiable as ulna distal fragments; the remaining 10 are long bone shaft fragments. All of the ulna fragments and nine of the other pieces were deliberately cut; many of the bird bones also exhibit evidence of shaping and polishing.

Antler Spatulates

Three elk antler tools are classified as spatulates. On one specimen (9-4/2-1) the tip is rounded, while on the other two specimens (10-5/2-1 and 11-4/1-F3-1) the tips are more pointed (Figure 7-8,d-e). All three specimens exhibit polish along the tips, especially on the ventral surfaces.

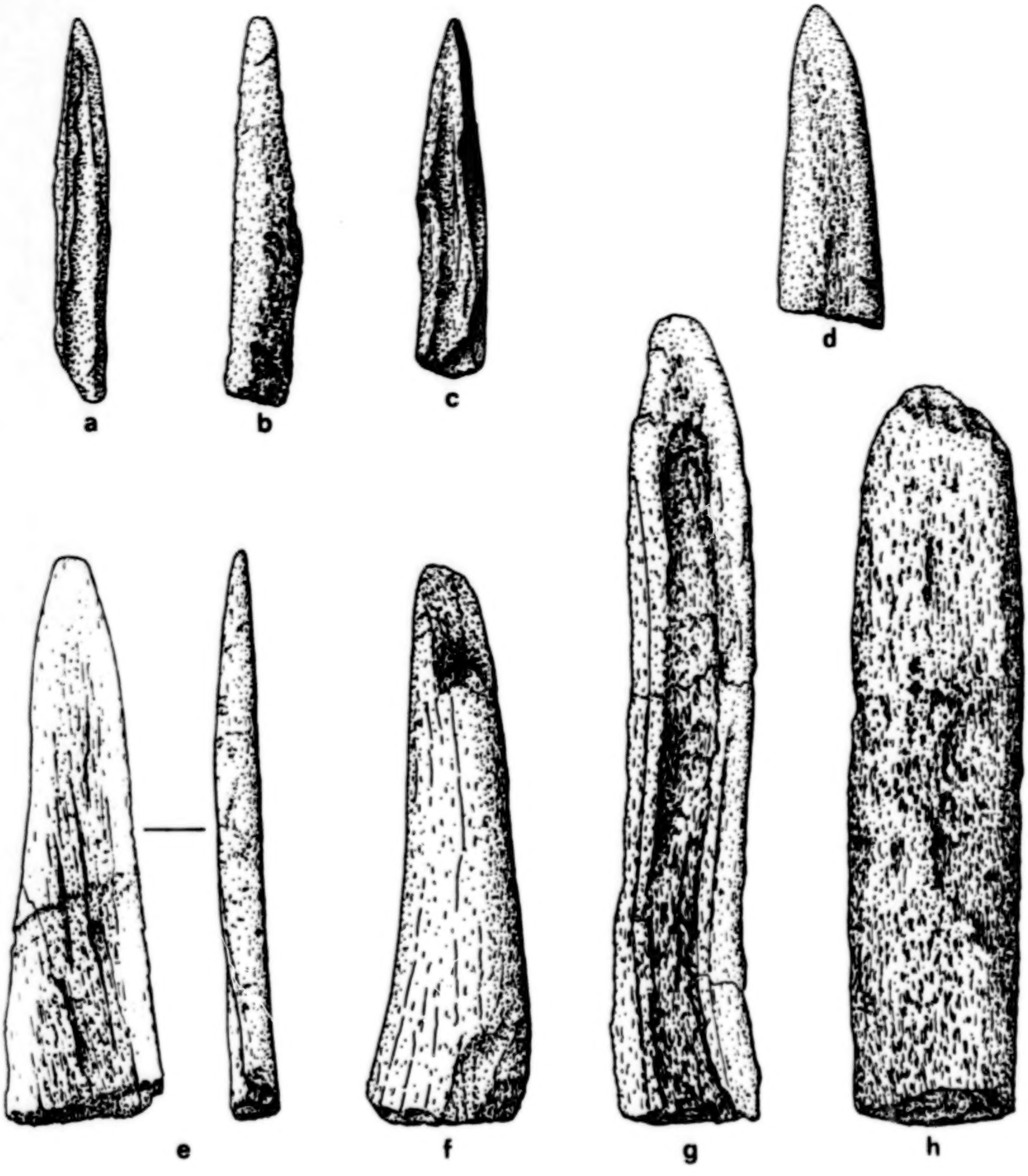

Figure 7-8. Chisels, spatulates, and wedges: a-c, bone chisels; d-e, antler spatulates; f-h, antler beam wedges (shown 70% actual size).

a. 42-11/2-1
b. 12-4/2-F3-1
c. 8-8/2-1
d. 11-4/1-F3-1
e. 10-5/2-1
f. 11-6/2-4
g. 10-4/2-3
h. 13-6/2-F11-1

Table 7-5. Dimensions of measurable wedges, chisels, and spatulates.

		Measurement (cm)			
Wedge Type	Specimen No.	Length	Width	Thickness	Bit Width
Bone Wedge	39-9/2-1	8.2	3.4	1.8	2.4
Bone Chisels	8-8/2-1	7.9	1.5	1.0	1.0
	12-4/2-F3-1	8.5	1.4	1.0	0.6
	42-11/2-1	8.4	1.2	0.6	0.6
Antler Wedges	10-4/2-3	17.7	3.2	2.4	1.5
	13-6/2-F11-1	12.2	3.9	2.3	1.4
	11-6/2-4	16.1	3.8	2.0	3.0
	43-11/2-1	16.1	4.1	1.1	2.5
Antler Spatulates	9-4/2-1	--	3.3	1.2	2.7
	10-5/2-1	12.3	3.5	0.8	1.0
	11-4/1-F3-1	--	2.4	1.0	1.1

Antler Beam Wedges

Four antler wedges are made from the beams of elk-size antlers (Figure 7-8,f-h). Measurements are provided in Table 7-5.

Antler Tine Wedge

A tip fragment from an antler tine wedge was also recovered. The tine is from an elk-size antler, but is too fragmentary to yield meaningful measurements.

Used Antler Tines

One complete (23-11/2-1) and two fragmentary (11-6/2-2, 24-3/1-1) antler tines from deer exhibit use-wear at the tips suggesting employment as casual prying or punching tools. The use-wear on these specimens reflects only light use in comparison with the heavy-duty wear evident on the antler wedges. The complete specimen measures 22.5 cm in length (Figure 7-9c).

Antler Sleeve Haft

A section of antler (25-10/1-F10-2) has been hollowed out and modified to serve as a sleeve haft (Figure 7-9b). A small portion of

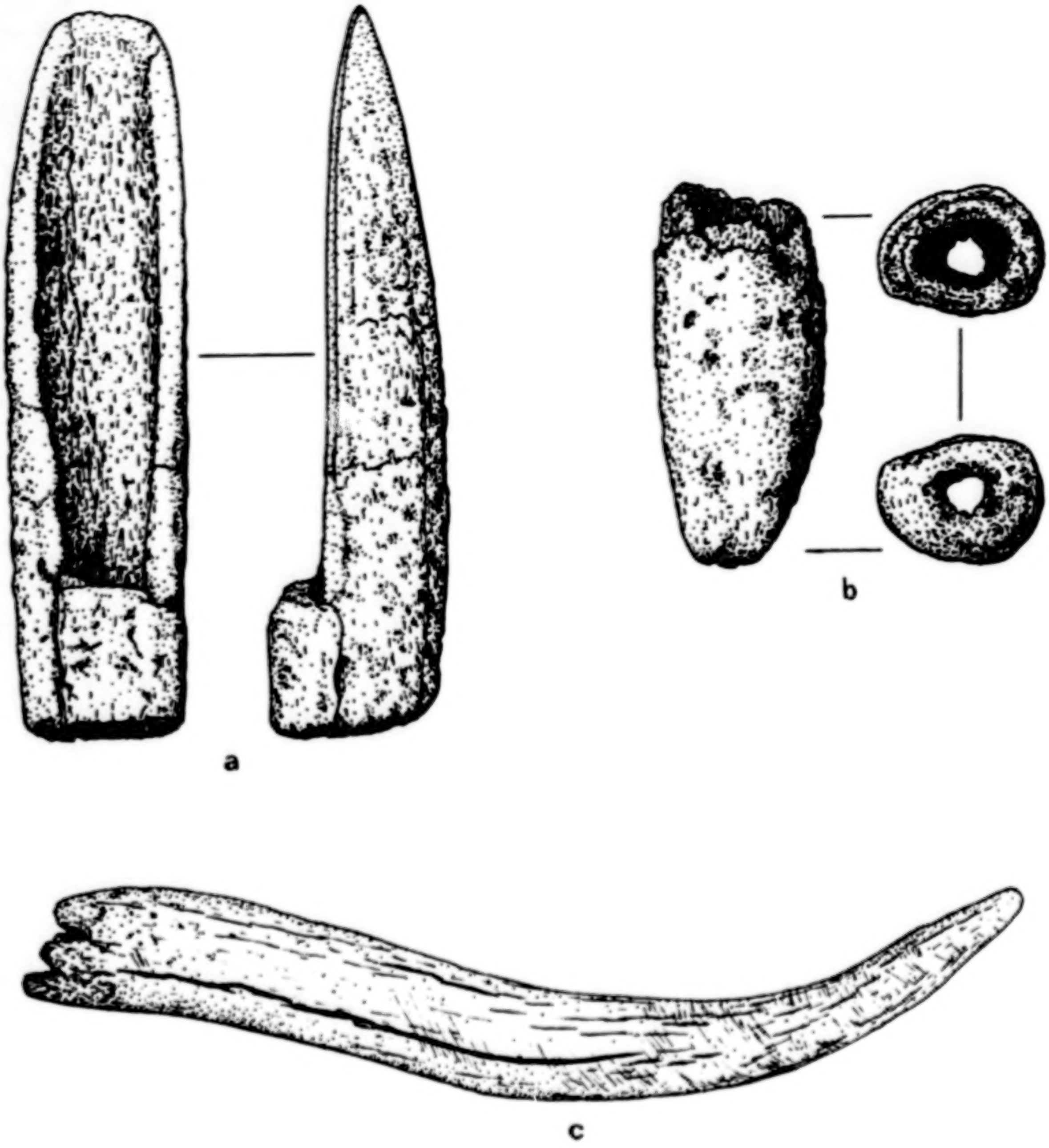

Figure 7-9. Miscellaneous antler artifacts: a, flesher; b, sleeve haft; c, used antler tine (shown 70% actual size).

a. 11-7/2-1 b. 25-10/1-F10-2 c. 23-11/2-1 one end is missing; present dimensions are 7.6 x 3.5 x 2.6 cm. An oval opening in one end measures 1.8 x 1.2 cm, while a round opening at the other end measures 1.0 cm in diameter. Elk antler hafts were commonly used by coastal peoples as handles for chisels or celts.

Antler Flesher

An unusual implement of elk antler (11-7/2-1) is tentatively classified as a flesher (Figure 7-9a). In making this tool, the antler was cut longitudinally from the distal end to a cross-cut within 3 cm of the proximal end. While the proximal end is a hollow ring, the distal end tapers to a blunt tip, which exhibits polish from use-wear. Based on the shape of the tip and the nature of the use-wear, it is suggested that this implement was employed in removing skins from animals (Don E. Dumond, personal communication, 1990). This artifact measures 14.6 cm in length. The proximal end is 3.4 cm wide and 3.7 cm thick. The distal end is 2.3 cm wide and 0.6 cm thick.

Antler Figurine

A fragmentary object (38-15/3-F15-3) carved from elk antler may represent an anthropomorphic figure (Figure 7-10a). Although badly weathered, it is possible to discern that the object includes a head, shoulders with crossed arms, and tapering legs. This object measures 16.0 cm in length (a small portion of the distal end is missing), 3.6 cm wide at the proximal end, and 4.0 cm across the "shoulders." Maximum thickness is 1.7 cm. This object was recovered from the living surface in Area A (Feature 15) along with the chert graver and antler pendant described below.

Antler Pendant

A carved object (38-15/3-F15-2) made from elk antler features a biconically drilled hole suggesting use as a pendant (Figure 7-10b). The object has been shaped and incised and may represent a stylized marine mollusc (scallop?). It measures 7.0 cm in length, 5.6 cm in width, and 1.3 cm in thickness. This object was recovered from the living surface in Area A (Feature 15) along with the chert graver and antler carving described above.

Worked Antler

Two elk antler bases and two elk antler beams bear evidence of cutting and/or grooving marks made in the process of removing tines.

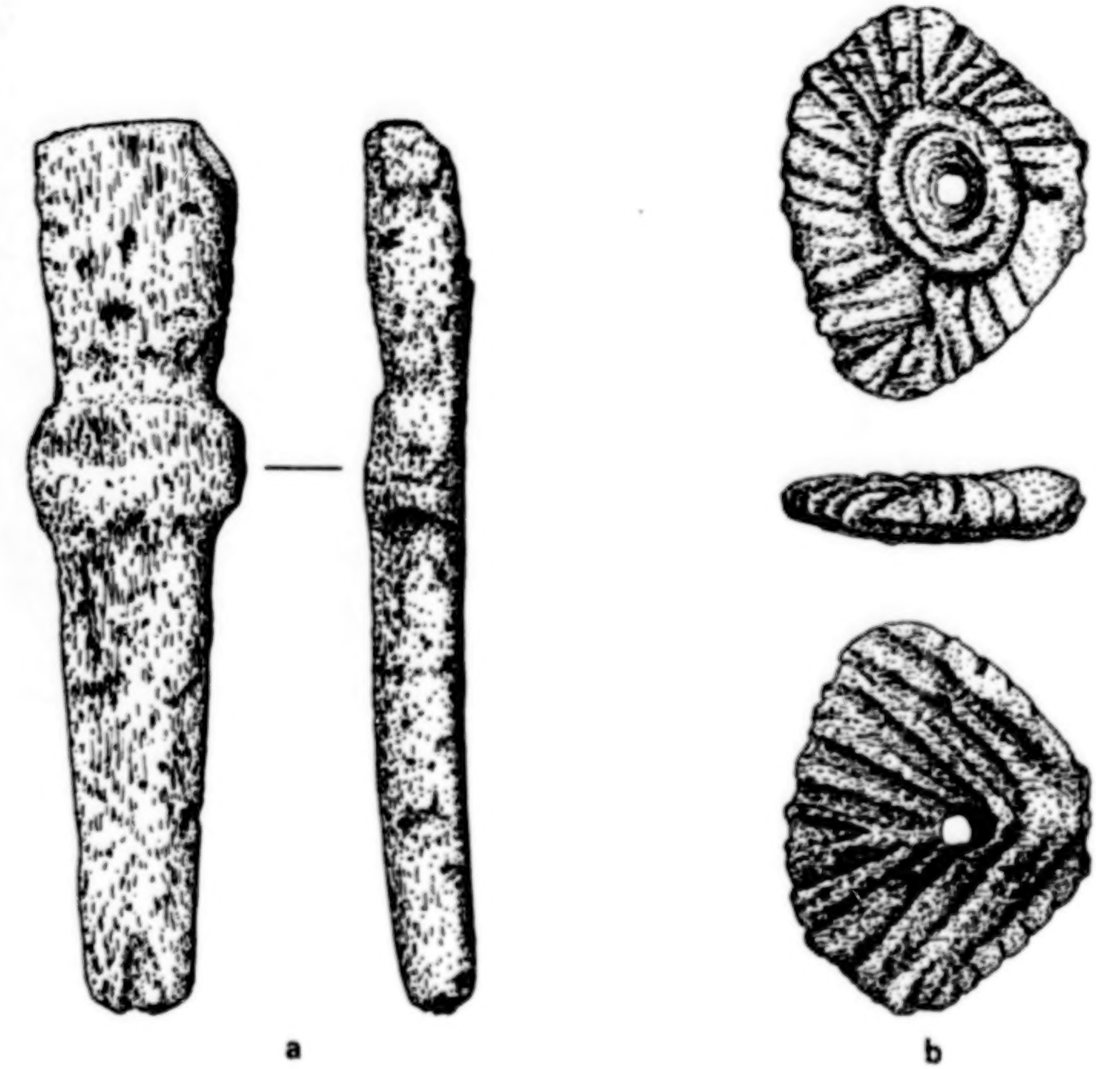

Figure 7-10. Antler figurine (a) and pendant (b) (shown 70% actual size).

a. 38-15/3-F15-3 b. 38-15/3-F15-2

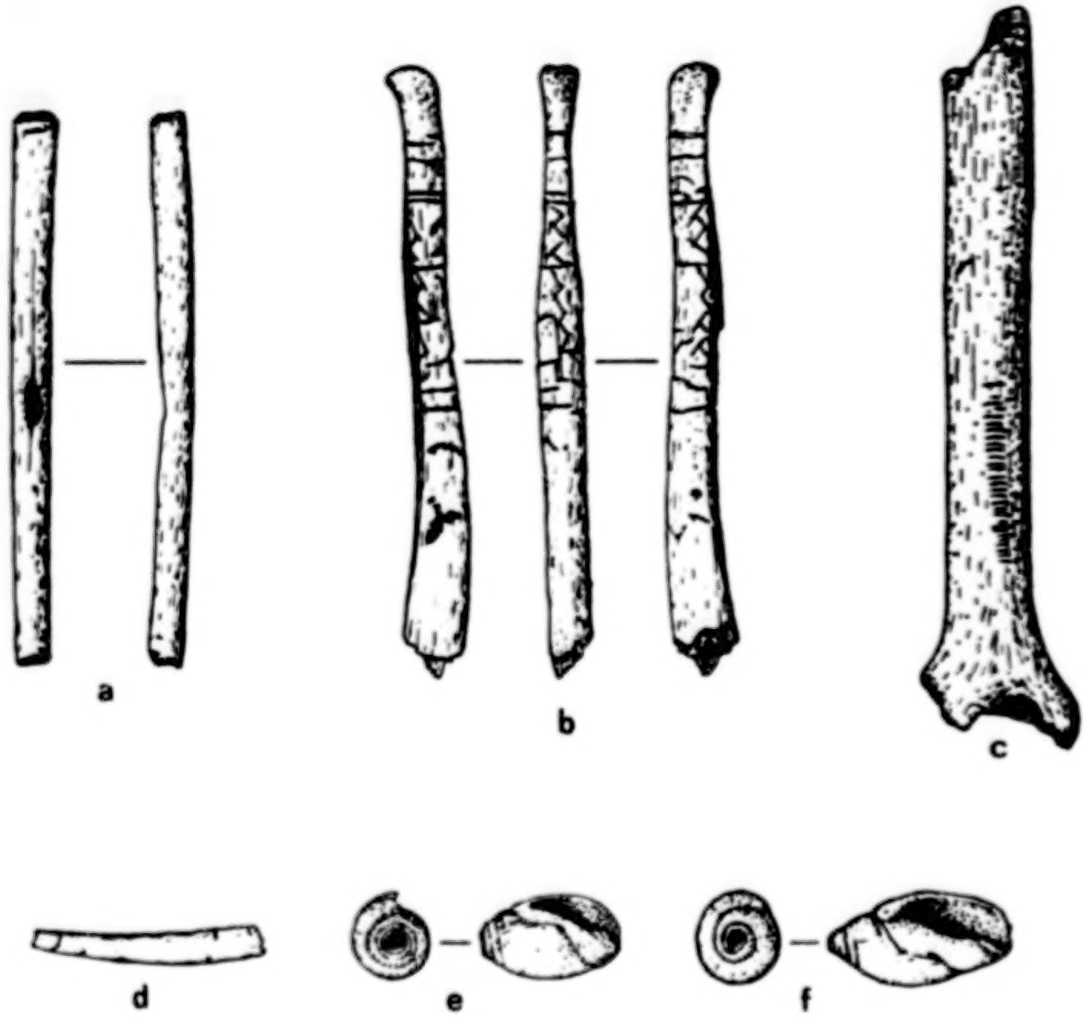

Figure 7-11. Miscellaneous bone and shell artifacts: a, bone whistle; b-c, decorated bone; d, dentalium shell; e-f, olivella shells (shown actual size).

a. 11-6/2-3 c. 8-7/2-1 e. 23-6/2-1
b. 13-5/2-1 d. 11-5/2-2 f. 12-5/2-1

SHELL SERIES

The 13 artifacts manufactured from shell recovered from Yaquina Head in 1989 can be divided into two groups: shell beads and shell tools. The beads include a single dentalium shell (Figure 7-11d) and eight olivella shells (Figure 7-11,e-f). Both of these species were commonly used as beads among native peoples of the Northwest Coast.

One fragment of unidentified shell has been ground into an elongated shape. Although no means of attachment is apparent on this piece, it may represent a bead or pendant fragment.

The shell tools include one giant chiton *(Cryptochiton stelleri)* valve and two sea mussel *(Mytilus californianus)* shells with unifacially ground edges. Such artifacts may have been used for casual cutting or scraping purposes.

CHAPTER 8

DEBITAGE ANALYSIS

by Robert R. Musil

Lithic debitage, the waste products from the making of chipped stone tools, constituted more than 92% of the artifact collection recovered during the 1989 investigations at Yaquina Head. Accordingly, these materials were analyzed in some detail in order to reconstruct the nature of stone tool-making activities at the site.

A total of 2285 pieces of lithic debitage was collected during the 1989 excavations at Yaquina Head. Of that total, seven pieces were recovered from column samples, 32 pieces were recovered from the auger hole tests, and 2246 were collected from the unit excavations. The debitage was analyzed in terms of five descriptive attributes: (1) raw material type, (2) debitage type, (3) amount of cortex (if any), (4) flake size (the maximum dimension of each flake), and (5) the type of preparation present on the striking platform of each flake (if applicable). These categories include the analytical classes employed in the analysis of the debitage collected during the 1986 excavations (Minor and Musil 1987:93-99).

In addition to the 1986 analytical classes, the 1989 analysis expands the cortex class to include a twofold division of the amount of cortex on the dorsal surface of each flake. Primary cortex is used to indicate 100% cortical coverage, while secondary cortex is the presence of some cortex, but less than 100%. An additional platform preparation class is added as well. These revisions in methodology were incorporated into the present analysis in an attempt to further enhance the interpretation of the lithic reduction strategies undertaken at the site.

RAW MATERIALS

The debitage from the 1989 excavations is dominated by chert, which accounts for just over 74% of the total. Basalt totals a little more than 24%, with obsidian, petrified wood and other stone (items in this category appear to be a blocky quartz material) together accounting for only 1.8% of the total debitage recovered (Table 8-1). The predominance of chert and basalt is clearly due to their local availability. Basalt cobbles are abundant on the beach below the headland,

Table 8-1. Tabulation of lithic debitage by raw material and stratum.

	Area A/Stratum			Area B/Stratum			Area C				
Material	1	2	3	1	2	3	1	Auger Holes	Column Samples	Total	%
Chert	720	180	307	314	128	12	10	18	4	1693	74.1%
Basalt	173	73	57	57	120	58	-	13	1	552	24.2%
Obsidian	16	1	6	1	-	-	-	1	2	27	1.2%
Petrified Wood	-	-	-	-	2	-	-	-	-	2	0.1%
Other	-	1	-	8	-	-	2	-	-	11	0.5%
TOTAL	909	255	370	380	250	70	12	32	7	2285	
%	39.8%	11.2%	16.2%	16.6%	10.9%	3.1%	0.5%	0.3%	1.4%		

and were apparently carried up for use in rock oven features associated with the processing of shellfish. Smaller chert cobbles are available on Agate Beach just to the south of Yaquina Head. In contrast, the closest known obsidian sources suitable for stone tool manufacture are located some distance to the east in the Upper Willamette Valley and the Cascade Range (Skinner 1986).

DEBITAGE CLASSES

The debitage was divided into four mutually exclusive flake classes, following the system proposed by Sullivan and Rosen (1985): (1) complete flakes, (2) broken flakes (flake fragments retaining the striking platform), (3) fragments (flake fragments that do not retain the striking platform), and (4) debris (angular chunks that exhibit more than one interior surface). A fifth class consisting of heat spalls was also included to record the presence of this debitage type. Heat spalls or potlid fractures are common debris from the heat treatment of lithic materials.

Complete flakes are most common, comprising 56% of the debitage assemblage (Table 8-2). They are especially prevalent among the basalt debitage (78% of the basalt assemblage), but also account for 56% of the obsidian and 50% of the chert debitage. Flake fragments are also well represented, constituting 31% of the debitage as a whole. Most of the flake fragments are found among the chert debitage, constituting 35% of the chert assemblage, and secondarily among the basalt debitage (21%). The remaining classes of debitage, including debris (10%), broken flakes (2%), and heat spalls (0.6%) account for relatively small proportions of the total debitage recovered.

Table 8-2. Tabulation of debitage by raw material and debitage class.

	Debitage Class					
Material	Complete	Broken	Fragment	Debris	Spall	TOTAL
AREA A						
Stratum 1						
Chert	341	18	259	96	6	720
Basalt	132	1	37	3	-	173
Obsidian	9	4	3	-	-	16
Stratum 2						
Chert	100	3	54	20	3	180
Basalt	57	-	12	1	-	73
Obsidian	1	-	-	-	-	1
Other	1	-	-	-	-	1
Stratum 3						
Chert	140	8	107	50	2	307
Basalt	52	-	5	-	-	57
Obsidian	3	2	1	-	-	6
Area A Total						
Chert	581	29	420	166	11	1217
Basalt	241	1	57	4	-	303
Obsidian	13	6	4	-	-	23
Other	1	-	-	-	-	1
Total	836	36	481	170	11	1534
Percent	54.5%	2.4%	31.3%	11.1%	0.7%	
AREA B						
Stratum 1						
Chert	153	2	122	36	1	314
Basalt	42	-	15	-	-	57
Obsidian	1	-	-	-	-	1
Other	-	-	-	8	-	8
Stratum 2						
Chert	80	4	35	8	1	128
Basalt	98	-	22	-	-	120
Petrified Wood	-	1	1	-	-	2
Stratum 3						
Chert	9	-	3	-	-	12
Basalt	40	-	16	2	-	58
Area B Total						
Chert	242	6	160	44	2	454
Basalt	180	-	53	2	-	235
Obsidian	1	-	-	-	-	1
Petrified Wood	-	1	1	-	-	2
Other	-	-	-	8	-	8
Total	423	7	214	54	2	700
Percent	60.4%	1.0%	30.6%	7.7%	0.3%	

Table 8-2 (continued)

	Debitage Class					
Material	Complete	Broken	Fragment	Debris	Spall	TOTAL
AREA C						
Stratum 1						
Chert	5	1	2	2	-	10
Other	1	-	1	-	-	2
Total	6	1	3	2	-	12
Percent	50.0%	8.3%	25.0%	16.7%		
AUGER HOLES						
Chert	6	1	8	3	-	18
Basalt	10	-	3	-	-	13
Obsidian	-	1	-	-	-	1
Total	16	2	11	3	-	32
COLUMN SAMPLES						
Chert	2	-	2	-	-	4
Basalt	-	-	1	-	-	1
Obsidian	1	-	1	-	-	2
Total	3	-	4	-	-	7
SITE TOTALS						
Chert	836	37	592	215	13	1693
Basalt	431	1	114	6	-	552
Obsidian	15	7	5	-	-	27
Petrified Wood	-	1	1	-	-	2
Other	2	-	1	8	-	11
Total	1284	46	713	229	13	2285
Percent	56.2%	2.0%	31.2%	10.0%	0.6%	

CORTEX PRESENCE/ABSENCE

A high percentage of flakes with cortex were found among the chert (41%) and basalt (57%) flakes (Table 8-3). This pattern is consistent with the inference that the reduction of locally available chert and basalt cobbles was a major activity at Yaquina Head. In contrast, the obsidian flakes recovered exhibit no cortex on any surface, a situation that supports the idea that the obsidian represented at the site was presumably obtained from distant sources. The relatively few obsidian flakes recovered probably reflect minimal retouch or resharpening of tools that were for the most part manufactured elsewhere and brought to the site in near-finished form.

FLAKE SIZE

The obsidian debitage consists of small flakes (<20 mm), which is in contrast to the larger chert and basalt flakes (Table 8-4). The majority of chert flakes (65%) range in size from 10-30 mm, reaching a maximum size of 80 mm. The basalt flakes on average are larger than the chert flakes, with 47% concentrated between 20-40 mm. There is also a higher proportion of basalt than chert flakes larger than 50 mm, and some basalt flakes measured over 90 mm. This pattern is most likely a product of the larger size of basalt cobbles in relation to chert cobbles used at the site.

PLATFORM PREPARATION

Flake size is also correlated with the type of platform preparation exhibited on individual flakes (Table 8-5). By definition, platform preparation applies only to the complete and broken flake classes, which retain the striking platform. Of these flakes, a higher proportion of large flakes (>30 mm) account for the majority of flakes with

Table 8-3. Tabulation of lithic debitage by cortex and raw material.

	Area A/Stratum			Area B/Stratum			Area C	Auger	Column	
Material	1	2	3	1	2	3	1	Holes	Samples	TOTAL
Chert										
Primary	10	3	4	4	7	-	-	-	-	28
Secondary	226	94	87	162	79	6	3	7	2	666
Interior	484	83	216	148	42	6	7	11	2	999
Basalt										
Primary	6	-	3	1	2	1	-	-	-	13
Secondary	111	54	33	35	92	39	-	7	-	371
Interior	56	19	21	21	26	18	-	6	1	168
Obsidian										
Interior	16	1	6	1	-	-	-	1	2	27
Petrified Wood										
Primary	-	-	-	-	1	-	-	-	-	1
Interior	-	-	-	-	1	-	-	-	-	1
Other										
Secondary	-	-	-	2	-	-	1	-	-	3
Interior	-	1	-	6	-	-	1	-	-	8
TOTAL	909	255	370	380	250	70	12	32	7	2285

cortex remaining on the platform. Crushed platforms also tend to be represented by a higher percentage of flakes larger than 30 mm in maximum diameter. Unprepared platforms are represented throughout the range of flake sizes, but the majority occur in the size ranges between 10 and 30 mm. Types of platform preparation such as grinding and faceting that are considered to be technological attributes of the later stages of biface reduction, and thus a more controlled removal of flakes, are most often found on flakes smaller than 30 mm. The majority of flakes that exhibit multifaceted and single faceted platforms indicative of late stage biface reduction are less than 20 mm and are usually obsidian.

Table 8-4. Tabulation of lithic debitage by material and flake size.

Material/	Area A/Stratum			Area B/Stratum			Area C	Auger	Column	
Size (mm)	1	2	3	1	2	3	1	Holes	Samples	TOTAL
Chert										
to 5mm	5	-	1	1	1	-	2	-	-	10
5-10	123	10	39	48	-	3	3	2	2	230
10-20	301	47	127	111	31	3	1	7	-	628
20-30	181	66	88	80	48	3	4	5	2	477
30-40	64	35	34	46	24	1	-	-	-	204
40-50	28	15	16	20	17	1	-	3	-	100
50-60	11	4	1	4	5	1	-	-	-	26
60-70	4	2	1	3	-	-	-	1	-	11
70-80	3	1	-	1	2	-	-	-	-	7
Basalt										
5-10	2	-	1	1	-	-	-	-	1	5
10-20	29	9	11	11	8	12	-	1	-	81
20-30	41	22	19	10	27	16	-	2	-	137
30-40	36	15	11	15	35	10	-	3	-	125
40-50	24	11	9	7	21	5	-	4	-	81
50-60	14	8	3	-	15	3	-	1	-	44
60-70	15	5	2	5	7	2	-	2	-	38
70-80	7	2	1	6	2	4	-	-	-	22
80-90	5	1	-	2	5	6	-	-	-	19
Obsidian										
to 5mm	1	-	-	-	-	-	-	-	-	1
5-10	14	1	3	1	-	-	-	-	2	21
10-20	1	-	3	-	-	-	-	1	-	5
Petrified Wood										
20-30	-	-	-	-	2	-	-	-	-	2
Other										
5-10	-	-	-	-	-	-	1	-	-	1
10-20	-	-	-	4	-	-	-	-	-	4
20-30	-	1	-	3	-	-	1	-	-	5
30-40	-	-	-	1	-	-	-	-	-	1
TOTAL	909	255	370	380	250	70	12	32	7	2285

Table 8-5. Tabulation of debitage by flake size and platform preparation for Areas A and B.

	Platform Preparation *							
Size	Crush	Grnd	SF	MF	Cortex	Unpr	No Plat	Total
AREA A								
0-5 mm	-	-	-	-	1	3	3	7
5-10 mm	4	1	17	6	3	60	102	193
10-20 mm	11	2	12	3	55	144	301	528
20-30 mm	15	1	6	1	126	96	173	418
30-40 mm	7	-	2	-	87	50	49	195
40-50 mm	4	-	-	-	58	16	25	103
50-60 mm	1	-	-	-	27	8	5	41
60-70 mm	-	-	-	-	19	7	3	29
70-80 mm	2	-	-	-	7	2	3	14
80-90 mm	-	-	-	-	6	-	-	6
Total	44	4	37	10	389	386	664	1534
Percent	2.9%	0.3%	2.4%	0.6%	25.5%	25.1%	43.1%	
AREA B								
0-5 mm	-	-	-	-	-	1	1	2
5-10 mm	2	-	2	3	-	14	32	53
10-20 mm	3	-	1	1	33	33	109	180
20-30 mm	3	-	2	-	80	26	78	189
30-40 mm	1	-	5	-	74	21	31	132
40-50 mm	3	-	-	-	48	8	12	71
50-60 mm	1	-	-	-	17	8	2	28
60-70 mm	-	-	-	-	11	2	4	17
70-80 mm	-	-	-	-	11	4	-	15
80-90 mm	-	-	-	-	10	2	1	13
Total	13	0	10	4	284	119	270	700
Percent	1.9%	-	1.4%	0.6%	40.6%	17.0%	38.6%	
AREA C								
0-5 mm	-	-	-	-	-	1	1	2
5-10 mm	1	-	-	-	2	1	-	4
10-20 mm	-	-	-	-	1	-	-	1
20-30 mm	-	1	-	-	2	-	2	5
Total	1	1	0	0	5	2	3	12
Percent	8.3%	8.3%	-	-	41.7%	16.7%	25.0%	
AUGER HOLES								
5-10 mm	-	-	-	-	-	-	2	2
10-20 mm	2	-	-	-	1	2	4	9
20-30 mm	-	-	-	-	-	2	5	7
30-40 mm	-	-	-	-	-	2	1	3
40-50 mm	-	-	-	-	5	-	2	7
50-60 mm	-	-	-	-	1	-	-	1
60-70 mm	-	-	-	-	3	-	-	3
Total	2	0	0	0	10	6	14	32

Table 8-5 (continued)

	Platform Preparation *							
Size	Crush	Grnd	SF	MF	Cortex	Unpr	No Plat	Total
COLUMN SAMPLES								
5-10 mm	1	-	1	-	-	-	3	5
20-30 mm	-	-	-	-	1	-	1	2
Total	1	0	1	0	1	0	4	7
SITE TOTAL	61	5	48	14	689	513	955	2285

* Crush = crushed Grnd = ground SF = single facet MF = multifacet
Unpr = unprepared No Plat = no platform (flake fragments, debris, spalls)

The basalt flakes are generally larger than flakes of obsidian or chert, and a higher proportion (70%) of the basalt flakes have cortex on their platforms. Regardless of material, most flakes with cortex on their platforms do not exhibit additional platform preparation. Chert flakes also exhibit a relatively high percentage of cortex on the striking platform, but slightly more have unprepared platforms. The few obsidian flakes recovered are all small and more than 80% exhibit some form of platform preparation. Single and multi-faceted platforms were observed on more than 56% of the obsidian flakes, and only 19% lack platform preparation. Crushed and ground platforms also occur in higher proportions on obsidian flakes than on the other material types. Less than 9% of the chert flakes and only 7.5% of the basalt flakes exhibit platform preparation, and single facet and crushed platforms account for most of those specimens.

COMPARISONS WITH THE 1986 DEBITAGE ASSEMBLAGE

The debitage assemblages from the 1989 excavations and the earlier 1986 excavations at Yaquina Head exhibit a number of similarities and differences. More debitage was collected in a smaller number of excavation units in 1986. This situation may be explained by the fact that most of the 1986 units were excavated in the shell midden (Area A), whereas in 1989 most of the units were on the edge of the shell midden and elsewhere on the site.

The percentages of obsidian represented in the 1986 and 1989 assemblages are similar. Obsidian flakes accounted for only 0.5% of the debitage recovered in 1986, and only 1.2% of the debitage recovered in 1989. Obsidian debitage recovered during both excavation seasons was characterized by small complete flakes lacking cortex on any surface.

Table 8-6. Tabulation of debitage by raw material and platform preparation for Areas A and B.

	Platform Preparation *							
Size	Crush	Grnd	SF	MF	Cortex	Unpr	No Plat	Total
AREA B								
Chert	8	-	6	2	158	74	206	454
Basalt	5	-	4	1	126	44	55	235
Obsidian	-	-	-	1	-	-	-	1
Petrified Wood	-	-	-	-	-	1	1	2
Other	-	-	-	-	-	-	8	8
AREA A								
Chert	26	-	27	3	222	330	599	1207
Basalt	16	-	5	1	167	53	61	303
Obsidian	2	3	5	6	-	3	4	23
Other	-	1	-	-	-	-	-	1
AREA C								
Chert	1	1	-	-	4	2	2	10
Other	-	-	-	-	1	-	1	2
AUGER HOLES								
Chert	2	-	-	-	3	2	11	18
Basalt	-	-	-	-	7	3	3	13
Obsidian	-	-	-	-	-	1	-	1
COLUMN SAMPLES								
Chert	-	-	1	-	1	-	2	4
Basalt	-	-	-	-	-	-	1	1
Obsidian	1	-	-	-	-	-	1	2
SITE TOTALS								
Chert	37 2.2%	1 <0.1%	34 2.0%	5 0.3%	388 22.9%	408 24.1%	820 48.4%	1693
Basalt	21 3.8%	-	9 1.6%	2 0.4%	300 54.3%	100 18.1%	120 21.7%	552
Obsidian	3 11.1%	3 11.1%	5 18.5%	7 25.9%	-	4 14.8%	5 18.5%	27
Petrified Wood	-	-	-	-	-	1 50.0%	1 50.0%	2
Other	-	1 9.1%	-	-	1 9.1%	-	9 81.8%	11

* Crush = crushed Grnd = ground SF = single facet MF = multifacet
Unpr = unprepared No Plat = no platform (flake fragments, debris, spalls)

In contrast, the ratio of chert to basalt flakes between 1986 and 1989 is significantly different. Chert accounted for only 47.3% of the debitage in 1986, but 74.1% of the debitage in 1989. Basalt flakes accounted for 51.9% of the debitage in 1986, but only 24.2% in 1989. This difference in percentages of chert and basalt debitage between the two field seasons is again considered to be related to the placement of excavation units. It appears that basalt flakes were more prevalent in the shell midden (Stratum 2) than they were in the non-shell deposits (Strata 1 and 3). For example, in the 1989 sample basalt accounts for 38.2% of the debitage from the shell midden, but only 19.8% from the non-shell deposits.

The preponderance of complete flakes in the 1989 debitage assemblage (obsidian 56%, chert 49%, and basalt 81%) is higher than the percentages of complete flakes reported for the 1986 assemblage (obsidian 41.3%, chert 39%, and basalt 26%). The broken flake class accounts for small percentages in all material types in both 1986 (obsidian 11.7%, chert 3.1 %, and basalt 2.3%) and 1989 (obsidian 26%, chert 2.1% and basalt 0.2%). Percentages of angular debris recovered during both seasons are also similar with chert angular debris accounting for 10% in 1986 and 12% in 1989. With the high percentages of complete flakes in 1989 and similar percentages of broken flakes and angular debris in both seasons, the percentages of flake fragments are considerably lower than recorded in 1986. The reasons for the predominance of complete flakes in 1989 are not readily apparent, but as noted for raw material distributions, the placement of more units in non-shell deposits rather than in the shell midden may be a factor.

The size of the flakes recovered during 1989 reflects a slightly higher percentage of large chert and basalt flakes than was recorded in 1986. However, a large number of flakes exceeding 30 mm were recovered during both seasons. These flakes were produced during the reduction of large cobbles of basalt and chert at the site. The obsidian flakes from both field seasons were normally smaller than 20 mm, reflecting a significant difference in the use of obsidian compared to basalt and chert.

The lack of cortex on any of the obsidian flakes is reflected in both the 1986 and 1989 assemblages. The percentage of chert (41%) and basalt (57%) flakes which retain cortex is higher than that recorded for 1986 (chert 23%, basalt 23%). This increase in the number of flakes exhibiting cortex may be the result of higher numbers of large flakes.

Although similar in many ways, the debitage assemblages from the 1986 and 1989 excavations exhibit noteworthy differences in the percentages of chert and basalt in terms of flake size, the increase in the number of complete flakes, and the increase in flakes with cortex. These dissimilarities are not interpreted as indicating different lithic reduction strategies, but rather are thought to reflect variability not only between the shell midden and non-shell deposits, but also within the shell midden itself.

DEBITAGE SUMMARY

The small collection of obsidian debitage is represented by small (<20 mm) flakes without cortex that are dominated by flakes with striking platforms (84%). The majority of obsidian flakes (81%) exhibit some form of platform preparation, with a slight majority being multifaceted. The obsidian debitage indicates that tool maintenance and fine controlled late stage biface reduction were the dominant, if not the only, activities carried out at the site using obsidian as a raw material. This interpretation of the obsidian debitage is consistent with the recovery of two completed obsidian tools and the preform recovered at the site in 1989.

In contrast, the chert and basalt debitage is very different from the small obsidian collection. The chert debitage consists of larger flakes (>20mm), many with cortex (41%). Over half of the chert flakes still retain striking platforms (51%), and unlike the obsidian, a substantial percentage (13%) are angular debris. Less than 9% have prepared platforms, and of those that do not 44% have cortex remaining on the striking platform. The basalt flakes are even larger on the whole (most >30 mm), more have cortex (57%), and a larger percentage have cortex on the striking platform (69%). Very few basalt flakes exhibit platform preparation (7.4%) and most of those that do have crushed platforms.

Core reduction, involving the reduction of chert cobbles was the dominant activity using chert as a raw material. The chert cobbles were heat treated, perhaps in the same rock-lined cooking pits as the shellfish. The use of these cooking pits to heat chert as well as food stuffs allowed the native worker to kill two birds with one stone, so to speak. Then, using direct free-hand percussion the cobbles were split and successive flakes were removed from these split cobble cores. This method of core reduction results in a high number of flakes with cortex on the striking platform, as well as numerous secondary cortex flakes.

The evidence provided by flakes exhibiting crushed platforms supports the inference that a hard hammer technique was employed in the reduction of chert cobbles. Sullivan and Rozen (1985) classify this process as intensive core reduction, which is represented by almost equal numbers of complete flakes and flake fragments and higher than normal percentages of angular debris.

There is only minimal evidence for bifacial reduction of the chert flakes produced. Very few chert flakes were recovered with faceted platforms indicating biface reduction, and only a few flakes that exhibited bifacial flaking on their margins were present. The fact that few chert bifaces were recovered also indicates that biface reduction was not a main activity at the site. The reduction of chert nodules was apparently oriented toward the production of flake blanks from split cobble cores removed to another locality for further bifacial reduction. The lack of large numbers of small flakes with prepared platforms and the lack of finished bifacial tools both support this inference.

The basalt debitage consists of even larger flakes than the chert debitage, and includes a higher proportion of flakes with cortex. Basalt cobbles are readily available and abundant at the site. The high numbers of large complete flakes, few flake fragments or angular debris, and the large number of flakes which retain cortex on their platforms indicate that unintensive core reduction was the main activity using basalt as a raw material (Sullivan and Rozen 1985). Unintensive core reduction results in cores with few flakes removed and a high number of large complete flakes retaining cortex, especially cortex remaining on the striking platform. The basalt cobbles are larger than the chert cobbles, producing larger flakes, and since only a few flakes are removed from a single core the amount of cortex is higher as well. In fact, over 69% of the striking platforms on the basalt flakes exhibit cortex, and very few basalt flakes exhibit platform preparation. The few exceptions are flakes with crushed platforms suggesting hard hammer percussion, rather than preparation of the striking platform to allow controlled flake removal.

As with the chert assemblage, very few basalt tools are present in the total artifact collection and, except for a few crude bifaces and used flakes, the only tool class represented is the large unintensively-reduced cores. The basalt debitage indicates that flake blank production from unintensive core reduction was the main use of basalt as a raw material for stone tool manufacture. The reduction of basalt cores was even less intensive than that for chert, and very few examples of the later stages of tool production are present. The production of basalt flake blanks appears to have been another end product for the use of basalt at the site. The recovery of only a few crude bifacial and unifacial tools of basalt suggests that reduction of basalt was carried out on a less intensive scale than the reduction of chert.

Three reduction strategies, each associated with a different raw material, were delineated by the analysis of debitage from the 1989 excavations at Yaquina Head. The first strategy was associated with the obsidian debitage and reflects the late stage thinning of small bifacial implements and the resharpening of finished tools. The second strategy involved intensive reduction of locally available chert nodules and pebbles into flake blanks. The majority of the chert debitage exhibits cortex on the striking platforms with little platform preparation. Heat treatment of chert material in the shell-cooking hearths is evidenced by the recovery of heat spalls among the debitage.

The basalt debitage exhibits attributes that suggest a less intensive reduction of basalt cores than that observed for chert. The large cortex-covered flakes that make up the majority of the basalt debitage and the basalt cores that exhibit only a few haphazard flake removals indicate a less intensive, perhaps almost casual, removal of basalt flakes from the abundant collection of cooking stones encountered within the cultural deposits. The site was clearly not a major locality for the stage reduction of bifaces, but instead reflects the reduction of locally available chert and basalt cores into suitable flake blanks.

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CHAPTER 9

PREHISTORIC OCCUPATION AT YAQUINA HEAD

by Rick Minor and Ruth L. Greenspan

Previous investigations at 35LNC62 on Yaquina Head were focused on the shell midden exposed along the headland's north face and the adjacent non-shell cultural deposits, referred to in this report as Area A. In contrast, the 1989 investigations were carried out over a much wider portion of the headland. In addition to further excavations in Area A, the 1989 investigations resulted in the discovery of a second, separate shell midden, referred to as Area B, as well as testing of adjacent dune remnants peripheral to the archaeological site, referred to as Area C. Accordingly, the results of the 1989 investigations allow a more complete reconstruction of prehistoric use of the headland, as well as a more refined assessment of the significance of 35LNC62 in Southern Northwest Coast prehistory.

ENVIRONMENTAL RECONSTRUCTION

Yaquina Head today would seem an unlikely location for a prehistoric settlement occupied over thousands of years. Only a few stunted pine trees occur along the headland's tip, and the nearest forest is almost a kilometer inland from the prehistoric site. The headland is swept by strong winds more or less throughout the year, and is fully exposed to heavy rainfall along the Oregon coast. Furthermore, the intertidal zone below the headland, from which the prehistoric inhabitants obviously derived much of their subsistence, is presently not very accessible from the top of the headland. These factors clearly indicate that the local environment at Yaquina Head has undergone significant changes since the prehistoric settlement was occupied. Some idea of the extent of these changes has been obtained as a result of information collected during archaeological investigations at the headland in 1986 and 1989.

As initially hypothesized during the 1986 investigations (McDowell 1987a:16-19), during the prehistoric timespan in which Yaquina Head was occupied a "sand ramp" may have existed that would have provided access from the top of the headland to the beach below. Geomorphological studies carried out in conjunction with the 1989 project suggest that this ramp probably consisted of a climbing sand dune. Evidence of climbing sand dunes has been observed at Yaquina Head and elsewhere along the Oregon coast in the form of eolian sand deposits plastered

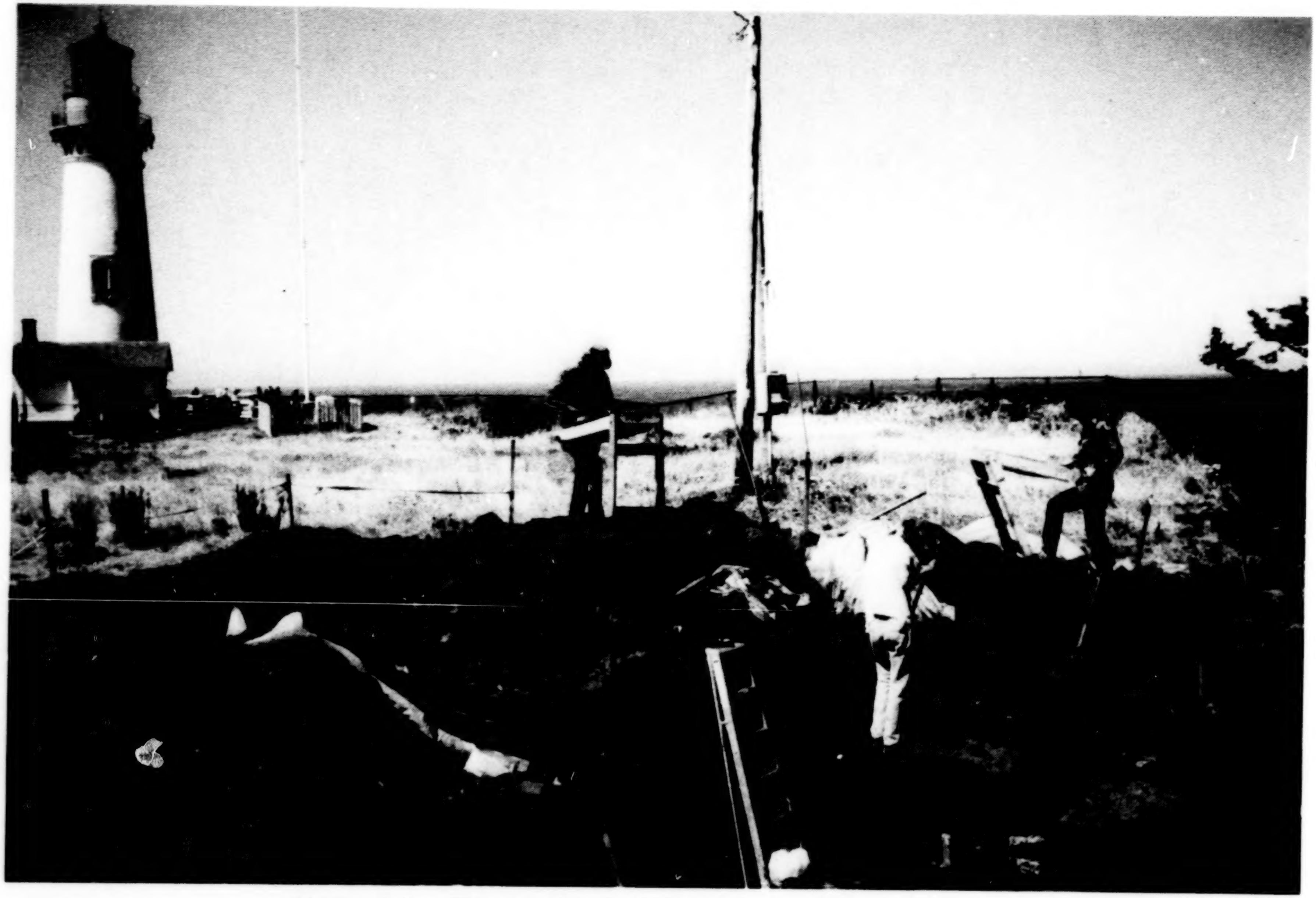

Figure 9-1. View to the west of block excavations in Area A.

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against steep bedrock slopes. Existing climbing dune deposits elsewhere along the Oregon coast are presently inactive and vegetated, and they commonly are truncated at their base and detached from the modern beach by wave erosion. This truncation presumably came about as a result of relative sea level rise in middle or late Holocene times, a development that may have been caused by glacio-estuatic sea level rise, by tectonic subsidence of the coastline, or by some combination of the two processes.

Yaquina Head was formed as a result of the constant erosional forces of wind and water bearing on the sediments and bedrock composing the headland. It seems reasonable to suggest that the pace of this erosion has increased as sea level has risen in postglacial times. Modern rates of erosional retreat along the Oregon coast are moderate to fast (<1 m/year) on Quaternary sediments like the sand dunes on top of Yaquina Head (McDowell 1987b). At the present time, landslide-prone bluffs and steep cliffs occur along all the headland's shoreline, providing strong evidence of the dynamic nature of the local landscape. Even if a conservative rate of erosion is projected, it is easy to envision that several thousand square meters of the headland have eroded into the sea over the last few thousand years. In view of this situation, it is important to emphasize that the cultural deposits remaining on the headland undoubtedly represent only a fraction of the prehistoric settlement that formerly existed on Yaquina Head.

Erosion of the headland may in turn have affected the natural vegetation on top of Yaquina Head. At the present time, the headland is covered by an herb- and shrub-dominated plant community like that found on other headlands along the central and northern Oregon coast (Davidson 1967). Early photographs of the lighthouse, however, indicate that a stand of trees formerly existed on the headland's northwest tip (Figure 1-2). These trees were presumably Sitka spruce and lodgepole pine, a few of which still survive in that portion of the headland.

That trees were once more extensive on Yaquina Head is suggested by two lines of evidence collected during the 1989 archaeological investigations. First, two sediment samples obtained during the archaeological excavations were analyzed in order to evaluate the potential for pollen preservation on the headland. A sample from a depth of 160-170 cm in Unit 30 yielded only about 100 pollen grains. The majority of identifiable grains were tree species, including spruce (4%), pine (15%), undifferentiated Pinaceae (probably pine or spruce, 50%), and alder (26%). A few grains of sedges and forbs were identifiable as *Rumex*, Cyperaceae, Teucrium, and Polypodiaceae. Charcoal fragments were abundant. The pollen assemblage from this first sample strongly suggests spruce forest as the local vegetation (Mary Edwards, personal communication, 1990). The age of the sediment sample from Unit 30 has not been directly established. However, a radiocarbon assay of 6350 ± 140 RCYBP (Beta-37501), derived from charcoal identified as Douglas fir, was obtained from 150-160 cm below surface in nearby Unit 42.

This date would seem to establish the presence of forest on the headland around 6000 years ago.

A second sediment sample, from the deep burned zone at 230-240 cm in Unit 1, contained only two somewhat corroded pollen grains identified as grass (Poaceae) and alder. Pollen originally deposited in this soil horizon probably was destroyed by burning (Mary Edwards, personal communication, 1990). A composite sample of charcoal identified as pine recovered from 210-260 cm in this unit produced a radiocarbon assay of 5330 ± 110 RCYBP (Beta-37500). The deep burned zone in Unit 1 was not a unique occurrence, as a similar zone was encountered in auger hole H3 across the archaeological site to the west. Charcoal identified as pitch-coated spruce recovered from 230- 240 cm in this auger hole yielded a radiocarbon assay of 5140 ± 70 RCYBP (Beta-37495). The two radiocarbon dates from the deep burned zone at locations some 80 meters apart are statistically the same, and seem to confirm the occurrence of an extensive forest burn across the headland approximately 5000 years ago.

The results of this initial pollen study are supported by identification of charcoal recovered from the cultural deposits during the course of the excavations. In addition to the charcoal samples submitted for radiocarbon dating (Table 3-3), charcoal samples collected from Unit 39 in Area A and Unit 12 in Area B were submitted for identification (Table 9-1). These samples consistently contain charcoal from Douglas fir and pine (including lodgepole pine), with spruce, red cedar, hemlock/yellow cedar, alder, birch, and other hardwoods also represented. The samples are composed for the most part of relatively small pieces of charcoal that cannot, in themselves, be taken as evidence of the existence of a forest on the headland. An exception to this situation was the discovery of a Sitka spruce limb uncovered at 130-140 cm in Unit 18 that was probably too large to have been carried into the site. The discovery of this limb, with a radiocarbon assay of 3990 ± 60 RCYBP (Beta-35151), provides direct support for the idea that sizable trees were growing on Yaquina Head approximately 4000 years ago.

While the extensive burning in evidence on Yaquina Head may have been simply a result of natural fires, it is interesting to note that native peoples are thought to have played a major role in the creation and management of vegetation communities along the Oregon coast. At the time of historic contact, many coastal headlands supported prairie grasslands rather than the coniferous forests more common today. In his study of the prairies on Cascade Head, Davidson (1967:63-64) noted that the abundance of charcoal in the soils pointed to a long history of fires. It was suggested that "fires set intentionally or unintentionally by the coastal Indians living on this prairie were responsbile for this charcoal." With the decline in the native population and increasing settlement by Euro-Americans, maintenance of prairies by fire ceased and many were overgrown by forests. While the lower burned zones observed on Yaquina Head are thought to predate occupation of

Table 9-1. Identification of charcoal samples from 35LNC62 (by Nancy A. Stenholm).

Unit	Stratum	Level	Material	Associated Radiocarbon Dates
AREA A				
39	1	6	Pine, Douglas fir	
39	1	9	Pine, Douglas fir branch	
39	1	10	Pine branch	
39	1	11	Pine branch, spruce, alder	
39	2	10	Mostly Douglas fir, trace of pine	3270 ± 60 RCYBP (Beta-37493)
39	2	11	Pine, Douglas fir, alder	
39	2	12	Pine, Douglas fir, birch	
39	2	13	Pine, Douglas fir, red cedar	
39	2c	13	Douglas fir twigs, pine	
39	2c	14	Pine, Douglas fir	
31	3	11	Mostly lodgepole pine, traces of Douglas fir, Rose family hardwood	3430 ± 70 RCYBP (Beta-37496)
39	3	12	Douglas fir, spruce, pine	
39	3	14	Pine branch	
38	3	15	95% lodgepole pine, 4% Douglas fir, traces of red cedar and alder	
38	3	15	80% lodgepole pine, 20% Douglas fir, trace of red cedar	4100 ± 60 RCYBP (Beta-37494)
39	3	16	Pine, spruce, hemlock/yellow cedar	
42	3	16	Douglas fir	6350 ± 140 RCYBP (Beta-37501)
AREA B				
12	1	4	Douglas fir branch and bole	
13	1	4	Douglas fir, trace of red cedar	2750 ± 60 RCYBP (Beta-37499)
12	1	5	Douglas fir, pine	
12	2	4	Douglas fir	
12	2	5	Douglas fir branch and bole, pine	
12	2	6	Douglas fir, pine, hemlock/yellow cedar, red cedar	
12	2	7	Douglas fir branch	
13	2	7	lodgepole pine	3670 ± 70 RCYBP (Beta-37497)
12	3	8	pine, alder	
12	3	9	Douglas fir, conifer twigs	
13	3	9	pitch-coated spruce with traces of alder, a diffuse hardwood, and dicot stem tissue	4050 ± 60 RCYBP (Beta-37498)
12	3	10	Douglas fir, diffuse hardwood twig	
12	3	11	Douglas fir branch	

Table 9-2. Summary of radiocarbon dates from 35LNC62.

Area	Arch. Stratum	Arch. Unit	Depth Below Datum (cm)	Age (RCYBP)	Age (cal. BP)*	Laboratory Number	Association
A	1	G	70-80	2310 ± 60	2344	Beta-20771	between shell layers; Feature 6
B	1	13	30-40	2750 ± 60	2850	Beta-37499	above shell
A	1	M	30-40	2880 ± 90	3027, 3012, 3001	Beta-20770	above shell
A	1	F	40-50	2930 ± 90	3159, 3153, 3139 3126, 3102, 3093 3079, 3070, 3062	Beta-20774	above shell; Feature 1
A	1	I/L	60-80	3200 ± 70	3441, 3427, 3412	Beta-19828	above shell; initial occupation below dune
A	2A	B	50-60	2670 ± 70	2777	Beta-19830	upper shell
A	2B	B	100-110	2980 ± 70	3236, 3235, 3207 3179, 3165, 3147 3144, 3087, 3084	Beta-19831	lower shell
A	2B	N	80-100	3110 ± 100	3360	Beta-19829	lower shell; Feature 10
A	2B	I	120-130	3120 ± 60	3377, 3373, 3362	Beta-20772	lower shell
A	2	39	90-100	3270 ± 60	3532, 3522, 3478	Beta-37493	Area A shell stratum
B	2	13	60-70	3670 ± 70	4076, 4074, 4061 4049, 4042, 4033 4017, 4014, 3985	Beta-37497	Feature 12
A	3	B	90-100	3360 ± 100	3637, 3620, 3609 3600, 3591	Beta-20773	below shell
A	3	C	100-110	3400 ± 240	3676, 3661, 3642	Beta-17841	from bone artifact below pithouse floor; Feature 5
A	3	31	100-110	3430 ± 70	3688	Beta-37496	Feature 15
A	3	I	160-170	3740 ± 110	4146, 4109, 4091	Beta-19832	below shell; Feature 9
A	3^n	18	130-140	3990 ± 60	4508, 4493, 4444	Beta-35151	burned Sitka spruce limb (Feature 16)
B	3	13	80-90	4050 ± 60	4533	Beta-37498	Just below shell
A	3	38	140-150	4100 ± 60	4804, 4773, 4606 4539, 4568	Beta-37494	Feature 15
A	$3^?$	A	120-130	5030 ± 80	5851, 5832, 5761 5741, 5739	Beta-19833	low burned zone
A	3^n	H3	230-240	5140 ± 70	5828	Beta-37495	low burned zone
C	3^n	1	210-260	5330 ± 110	6177, 6143, 6108	Beta-37500	low burned zone
A	$3^?$	42	150-160	6350 ± 140	7266, 7208, 7196	Beta-37501	below living surface (Feature 15)

* cal. BP following Stuiver and Reimer 1986

n = not directly associated with cultural material

? = of questionable association with cultural material

35LNC62, it is reasonable to speculate that the forest burns in evidence on the headland 4000-5000 years ago may represent intentional fires set by the early prehistoric inhabitants of the Oregon coast.

CHRONOLOGY OF HUMAN OCCUPATION

The chronology of prehistoric occupation at 35LNC62 has been established with the aid of 22 radiocarbon dates. Twelve dates were obtained in conjunction with analysis and reporting of the results of the 1986 excavations (Minor et al. 1987:36-41); another 10 dates were obtained in association with the 1989 investigations (Table 3-3). A complete list of the radiocarbon dates from 35LNC52 is presented in Table 9-2. While dates have been expressed in terms of uncorrected radiocarbon years before present (RCYBP) throughout this document, conversions to calendar ages by means of the calibration curve developed by Stuiver and Reimer (1985) are also provided. Annotations accompanying this table reflect current interpretations of the cultural associations of the radiocarbon dates from this site.

Previous investigations in 1986 resulted in the definition of two prehistoric cultural components at 35LNC62. The Yaquina I component was represented by cultural materials recovered from below the shell midden within sediments designated Stratum 3. The Yaquina II component was represented by cultural materials from the shell midden, designated Stratum 2, and the overlying non-shell deposit, designated Stratum 1. Radiocarbon dates available from the 1986 project suggested that Stratum 3 was separated in time from the later two strata, which seemed to be more or less contemporaneous.

The results of further investigations at 35LNC62 in 1989 indicate that the component definitions are no longer appropriate. Excavations revealed additional intensive use of Area A, notably in the form of the Feature 15 living surface, as well as a separate locus of occupation in Area B. The structure of the cultural strata in both areas appears to be the same, with the shell midden (Stratum 2) bounded by non-shell cultural deposits above (Stratum 1) and below (Stratum 3). Additional radiocarbon dates indicate, however, that prehistoric use of 35LNC62 involved overlapping occupations, both between strata and between areas of the site. As a result, the two cultural components distinguished on the basis of the 1986 investigations have melded into one occupation sequence.

This situation is well illustrated in an examination of the contemporaneity of the radiocarbon dates by means of Student's t-test. This statistic allows the pairwise comparison of the means of two dates to determine if they are likely to be the same age (Thomas 1979:206-207). A matrix of the observed t-values for each pair of dates was prepared (Table 9-3). The values were then compared to the expected t-value for a level of error at the .001 level (with t = 3.29).

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Table 9-3. Matrix of observed t-values for pairwise comparison of radiocarbon dates.

DATE	2670	2750	2880	2930	2980	3110	3120	3200	3270	3360	3400	3430	3670	3740	3990	4050	4100	5030	5140	5330	6350
2310	3.905	5.105	5.270	5.732	7.267	6.860	9.546	9.653	11.314	9.004	4.406	12.148	14.751	11.413	19.799	20.506	21.095	27.200	30.696	24.102	26.524
2670		0.868	1.842	2.280	3.131	3.605	4.881	5.354	6.508	5.653	2.920	7.677	10.102	8.207	14.317	14.968	15.511	22.201	24.951	20.401	23.511
2750			1.202	1.664	2.495	3.087	4.360	4.881	6.128	5.231	2.627	7.376	9.979	7.901	14.614	15.321	15.910	22.800	25.923	20.591	23.635
2880				0.393	0.877	1.710	2.219	2.807	3.606	3.568	2.029	4.824	6.929	6.051	10.262	10.817	11.279	17.855	19.822	17.238	20.849
2930					0.439	1.338	1.757	2.368	3.143	3.196	1.834	4.385	6.490	5.699	9.800	10.354	10.817	17.440	19.383	16.886	20.549
2980						1.065	1.519	2.222	3.145	3.113	1.680	4.546	6.970	5.829	10.955	11.606	12.148	19.285	21.819	18.024	21.530
3110							0.086	0.737	1.372	1.768	1.115	2.622	4.588	4.238	7.546	8.060	8.489	14.993	16.630	14.933	18.832
3120								0.868	1.768	2.058	1.132	3.362	5.966	4.948	10.253	10.960	11.549	19.100	21.910	17.638	21.206
3200									0.759	1.311	0.800	2.323	4.748	4.142	8.569	9.220	9.762	17.215	19.597	16.336	20.125
3270										0.772	0.525	1.735	4.339	3.751	8.485	9.192	9.782	17.600	20.283	16.441	20.221
3360											0.154	0.573	2.540	2.556	5.402	5.917	6.345	13.041	14.582	13.252	17.379
3400												0.120	1.080	1.288	2.385	2.627	2.830	6.443	6.960	7.310	10.617
3430													2.424	2.378	6.074	6.725	7.267	15.052	17.274	14.572	18.655
3670														0.537	3.471	4.122	4.664	12.794	14.849	12.732	17.122
3740															1.995	2.474	2.873	9.484	10.738	10.221	14.659
3990																0.707	1.296	10.400	12.474	10.694	15.494
4050																	0.589	9.800	11.823	10.216	15.100
4100																		9.300	11.280	9.816	14.772
5030																			1.035	2.206	8.186
5140																				1.457	7.730
5330																					5.729

Underline indicates those dates which are not significantly different at the $\alpha = 0.001$ ($t_{.001} = 3.29$).

The dates were given numerical designations, numbers 1-22, from latest to earliest in order to facilitate the presentation of data. Figure 9-2 shows the grouping of each date with other dates that are statistically the same. For example, date number 2 (2670 ± 70 BP) is statistically synchronous with dates number 3, 4, 5, and 6. The comparison shows that the 22 dates can be placed into four statistically significant groups (Figure 9-2).

The first group consists solely of date number 1, while the second group encompasses date numbers 2 through 18. These first two groups, then, include all of the dates interpreted as directly associated with human occupation at 35LNC62. The third group includes the three dates, numbers 19, 20, and 21, interpreted as reflecting non-cultural burning on the headland around 5000 BP. The fourth group consists solely of date number 22, which is much older than both the human occupation and the natural burn. Comparison of the radiocarbon dates in this way highlights the continuity that occurred in occupation of 35LNC62 between 2670 BP and 4100 BP.

When the distribution of radiocarbon dates is examined with respect to strata, however, important distinctions become apparent (Figure 9-3). Specifically, t-tests indicate that there is no significant difference in the radiocarbon dates from Strata 1 and 2. The radiocarbon dates from Strata 1 and 2, on the other hand, are significantly different from those from Stratum 3. This significance is derived from the fact that the central tendencies of the distribution of dates from each stratum do not overlap.

The same distinctions--with Strata 1 and 2 not significantly different from each other but Stratum 3 significantly different from both--were also found to be the case based on the smaller sample of 12 radiocarbon dates from the 1986 investigations. These distinctions were used to support the definition of two cultural components, Yaquina I and Yaquina II.

While it could be argued that the significant difference of the radiocarbon dates from Stratum 3 warrants definition of a separate cultural component, there is in fact little artifactual or faunal evidence to support such a distinction. More important, in our opinion, is the fact that there is actually some overlap in the dates from Strata 2 and 3 (Figure 9-3), and it is this continuity in occupation that has led us to a reinterpretation of prehistoric settlement at 35LNC62 in terms of a single, more or less continuous occupation sequence.

Prehistoric use of Yaquina Head may have begun as early as 6300 years ago, as indicated by the earliest radiocarbon assay of 6350 ± 140 RCYBP from 150-160 cm in Unit 42. However, this date is not strongly associated with cultural materials (a single large mammal bone was observed in the unit sidewall), and it is approximately 2200 years older than an assay of 4100 ± 60 RCYBP obtained from 140-150 cm in nearby Unit 38. Likewise, the 6350 BP date is slightly more than 1000

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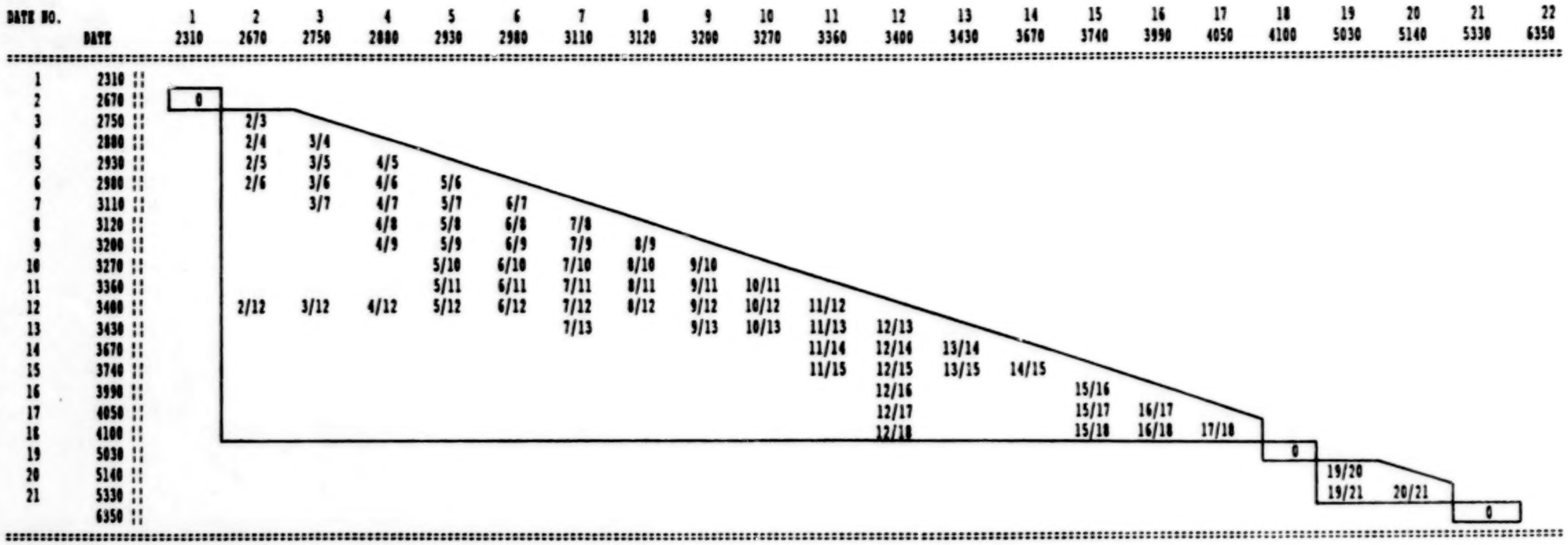
Figure 9-2. Summary of results of pairwise comparison of radiocarbon dates from Yaquina Head using Student's t-test (based on Table 9-3 results).



DATE NO.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	DATE	2310	2670	2750	2880	2930	2980	3110	3120	3200	3270	3360	3400	3430	3670	3740	3990	4050	4100	5030	5140	5330	6350
1	2310																						
2	2670	0																					
3	2750		2/3																				
4	2880		2/4	3/4																			
5	2930		2/5	3/5	4/5																		
6	2980		2/6	3/6	4/6	5/6																	
7	3110			3/7	4/7	5/7	6/7																
8	3120				4/8	5/8	6/8	7/8															
9	3200				4/9	5/9	6/9	7/9	8/9														
10	3270					5/10	6/10	7/10	8/10	9/10													
11	3360					5/11	6/11	7/11	8/11	9/11	10/11												
12	3400		2/12	3/12	4/12	5/12	6/12	7/12	8/12	9/12	10/12	11/12											
13	3430							7/13		9/13	10/13	11/13	12/13										
14	3670											11/14	12/14	13/14									
15	3740											11/15	12/15	13/15	14/15								
16	3990												12/16			15/16							
17	4050												12/17			15/17	16/17						
18	4100												12/18			15/18	16/18	17/18					
19	5030																		0				
20	5140																			19/20			
21	5330																			19/21	20/21		
	6350																					0	

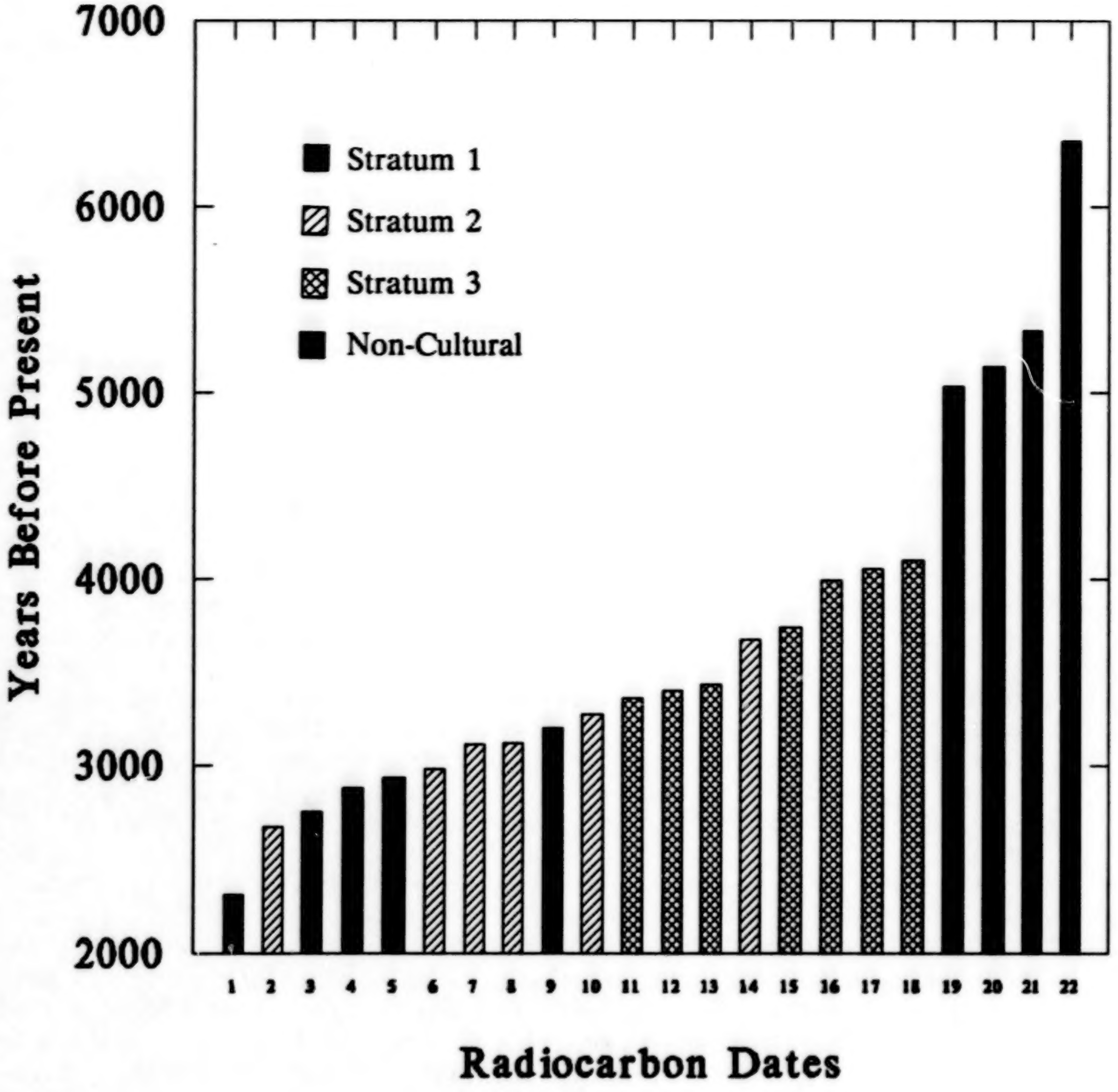


Figure 9-3. Distribution by stratum of radiocarbon dates from 35LNC62.

years earlier than the oldest assay of 5030 ± 80 RCYBP obtained during the 1986 investigations. Although cultural materials were not found in direct association with the charcoal that produced the 5030 BP date, they were found in adjacent unit/levels, and this date was accepted as valid in the previous report (Minor et al. 1987:37). However, it is noteworthy that the 5030 BP date overlaps at two standard deviations with the assays of 5140 ± 70 RCYBP and 5330 ± 110 RCYBP from burned zones underlying the cultural deposit. No evidence of human occupation was found in association with these burned zones. Thus, there is some reason for questioning whether the earliest dates actually reflect cultural activity, especially in view of the magnitude of their differences in comparison with later dates more firmly associated with prehistoric occupation on the headland.

Based on the radiocarbon dates obtained during the 1986 investigations, the Yaquina I component encompassing use of the headland prior to intensive shellfish exploitation was estimated to date from 5000-3200 BP (Minor et al. 1986:126-127; 142). New evidence from the 1989 investigations indicates a much shorter timespan for the earliest, pre-shell, occupation. As noted above, the 5030 BP date on which the age of initial occupation was based no longer seems acceptable. Instead, assays from Stratum 3 of 4100 ± 60 RCYBP from Area A and 4050 ± 60 RCYBP from Area B are considered the most reliable initial occupation dates.

In Area A, the latest radiocarbon assay for the Stratum 3 occupation (3360 ± 100 RCYBP) and the earliest assay from Stratum 2, the shell midden (3270 ± 70 RCYBP), are statistically the same. In Area B, radiocarbon assays for the Stratum 3 occupation (4050 ± 60 RCYBP) and the overlying shell midden (3670 ± 70 RCYBP) are only approximately 400 years apart. It seems quite likely that, as happened in Area A, this gap would close further if more radiocarbon dates were obtained from Area B. While a basal stratum of non-shell occupation may be represented, it is now clear that relatively little time elapsed before intensive shellfish exploitation began. The results of the 1989 investigations thus cast considerable doubt on the idea of a lengthy occupation of Yaquina Head prior to the intensive exploitation of shellfish.

The Yaquina I component was originally defined to highlight the apparent non-exploitation of molluscan resources during the earlier Stratum 3 occupation. While radiocarbon dates obtained from the 1986 investigations suggested that the Stratum 3 occupation completely predated intensive shellfish exploitation, additional dates from the 1989 project show that this situation is no longer true. It now appears that occupation of the dark non-shell cultural stratum referred to as the living floor in Area A, bracketed by radiocarbon assays of 3430 ± 70 RCYBP and 4100 ± 60 RCYBP, was in part contemporaneous with the exploitation of shellfish elsewhere on the headland, as indicated by the radiocarbon assay of 3670 ± 70 RCYBP from Area B. This inference is certainly reasonable, as it suggests that people were living in one area while dumping their mollusc shells and other refuse in another.

Radiocarbon dating in conjunction with the 1986 investigations indicated that intensive exploitation of molluscan resources at Yaquina Head began around 3200 years ago. As noted above, however, it is now known that intensive shellfish exploitation began at least by approximately 3700 BP, based on the radiocarbon assay of 3670 ± 70 RCYBP from Stratum 2 in Area B. In all, six radiocarbon dates from Stratum 2 document the intensive exploitation of molluscan resources at the headland over an 1100-year period between approximately 3700 and 2600 years ago.

The shell middens in Area A and Area B at Yaquina Head are overlain and bordered by the non-shell cultural deposits of Stratum 1. Radiocarbon assays from Stratum 1 range from 3200 ± 70 RCYBP to 2310 ± 60 RCYBP, reflecting considerable temporal overlap with deposition of Stratum 2. It was for this reason that the cultural materials from Stratum 1 and Stratum 2 were considered together as representing the Yaquina II component, estimated to dated from 3200-2000 BP (Minor et al. 1987:127-133). Data obtained from the 1989 investigations are consistent with the interpretation of Strata 1 and 2 as more or less contemporaneous.

The additional radiocarbon dates obtained during the 1989 investigations do not change the conclusion previously drawn that 35LNC62 ceased to be occupied around 2000 years ago. No radiocarbon assays later than the date of 2310 ± 60 RCYBP as listed in the 1986 project report were obtained during the 1989 investigations. The inference that the site was abandoned by 2000 years ago is supported by the fact that no projectile points or other temporally-diagnostic artifacts indicative of late prehistoric occupation were found, nor were any historic trade items introduced as a result of contact with Euro-Americans recovered.

The period of intensive occupation at Yaquina Head is thus established by radiocarbon dating as occurring between approximately 4100 and 2000 years ago. The occupation is thus placed primarily within the time frame of the Middle Archaic period on the Southern Northwest Coast (Minor 1989a).

THE ARTIFACT ASSEMBLAGE

A complete inventory of cultural materials recovered from 35LNC62 is presented in Table 9-4. Included are the artifacts recovered from Area A during the 1986 investigations, as well as the materials recovered from areas A, B, and C during the 1989 investigations described in this report. It can be readily seen that the bulk of the artifact collection was recovered as a result of the two sessions of excavations in Area A.

When looking at the artifact assemblage as a whole, perhaps the most striking aspect is its well-rounded nature. It is apparent that artifacts associated with a wide range of activities are represented. Artifacts utilized in food procurement include projectile points, harpoon dart head fragments, and a possible fish gorge. More common are artifacts related to food processing, such as knives, flake knives, cobble flake knives, choppers, and an apparent grinding stone.

Most common of all are artifacts associated with maintenance and manufacturing activities. Woodworking is presumably reflected in the recovery of bone/antler chisels and wedges, as well as a stone wedge. Hideworking is indicated by scrapers, bone-working by the numerous

Table 9-4. Complete inventory of cultural materials recovered in 1986 and 1989 from 35LNC62.

Artifact Class	Area A (1986)	Area A (1989)	Area B	Area C	TOTAL
Flake Tool Series					
Projectile Points	2	3	-	-	5
Preform	-	-	1	-	1
Drills	1	2	-	-	3
Perforator	-	-	1	-	1
Knife	-	1	-	-	1
Flake Knives	4	-	-	-	4
Bifaces	13	3	1	-	17
Scrapers	4	-	1	-	5
Gravers	6	3	-	-	9
Used Flakes	11	7	5	-	23
Cobble Tool Series					
Hammers	6	13	1	-	20
Anvils	3	-	-	-	3
Grinding Stone	1	-	-	-	1
Choppers	5	1	2	-	8
Used Cobble Flakes	6	5	2	-	13
Stone Wedge	-	1	-	-	1
Core/Debitage Series					
Cores	15	14	6	-	35
Debitage	3317	1557	7162	11	12,047
Manuport	-	1	-	-	1
Abrader Series					
Sandstone	42	14	5	-	61
Siltstone	4	1	-	-	5
Mudstone	1	-	-	-	1
Bone/Antler Series					
Harpoon Dart Head Frags	-	2	3	-	5
Split Bone Awls	8	6	4	-	18
Bone Needles	2	-	-	-	2
Bone Wedges	2	2	1	-	5
Bone Chisels	-	1	2	-	3
Bone Flaker	-	-	1	-	1
Fish Gorge?	-	-	1	-	1
Bone Whistles	-	-	2	-	2
Bone Tube Bead	-	-	1	-	1
Carved Whale Bone	1	-	-	-	1
Decorated Bone	1	-	2	-	3
Worked Bone	5	7	20	-	32
Antler Spatulates	-	-	3	-	3
Antler Net Shuttle	1	-	-	-	1
Antler Tine Wedges	2	1	-	-	3
Antler Beam Wedges	3	1	3	-	7
Antler Flesher	-	-	1	-	1
Antler Pendant	-	1	-	-	1
Antler Figurine	-	1	-	-	1
Used Antler Tines	-	2	2	-	4
Antler Sleeve Haft	-	1	-	-	1
Worked Antler	-	1	3	-	4
Shell Series					
Ground Mussel Shell	-	2	1	-	3
Dentalium	-	-	1	-	1
Olivella Beads	1	6	2	-	9
Bead/Pendant Fragments	1	-	1	-	2

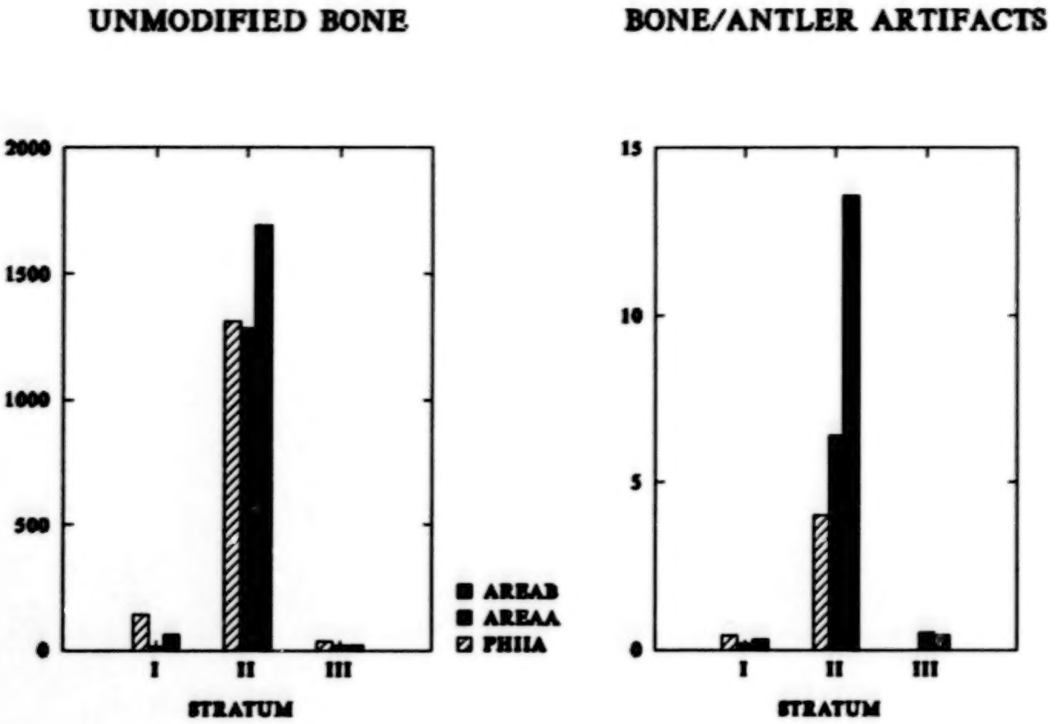
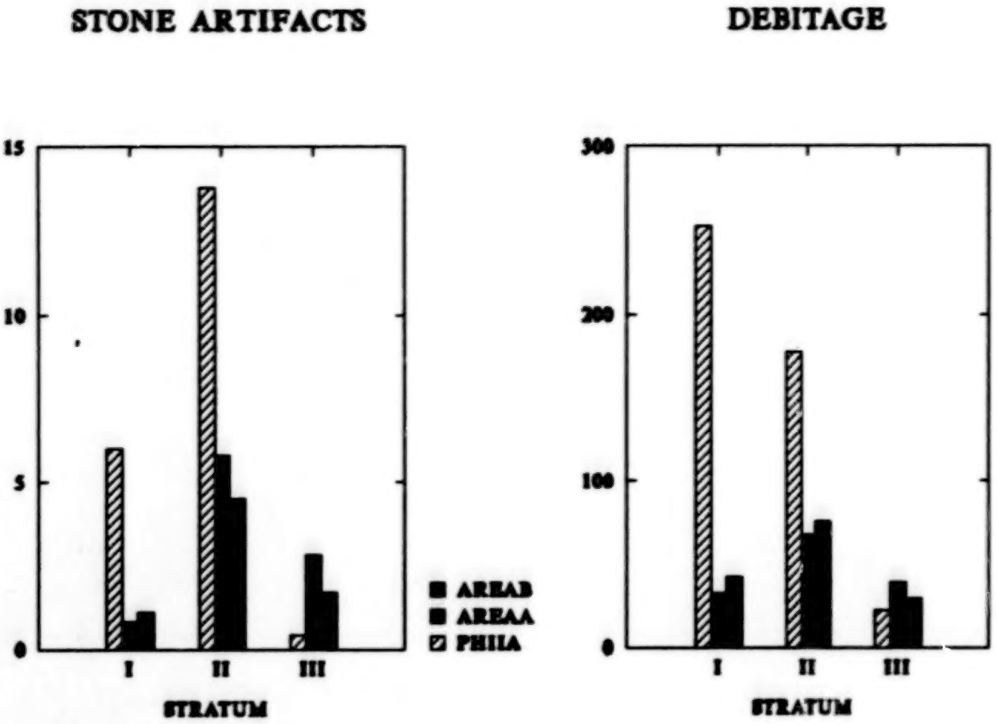


Figure 9-4. Comparison of the distribution of unmodified bone with bone and antler artifacts.

abraders, basketry manufacture by awls and needles, and net-making by an antler net shuttle. In addition, the recovery of 35 cores and more than 12,000 pieces of lithic debitage obviously provides direct evidence of stone tool manufacturing at the site.

Finally, it is noteworthy that the assemblage also includes a fair number of nonutilitarian items, such as bone whistles, a carved whale bone, and an antler figurine. Most of the non-utilitarian artifacts, however, are items of personal adornment, including the antler pendant, bone tube bead, and the shell beads.

The presence of a large number and variety of artifacts in an archaeological site is generally viewed as a reflection of a relatively sedentary population. Increased artifact variety would come about when the entire range of yearly maintenance activities is conducted in one location (Rafferty 1985:135). While not in itself conclusive, the recovery of a large and diverse artifact assemblage is one factor suggesting that the Middle Archaic settlement on Yaquina Head was a village.


STONE ARTIFACTS

DEBITAGE

Figure 9-5. Comparison of the distribution of stone artifacts and lithic debitage.

INTRASITE VARIABILITY

The distribution of cultural materials at 35LNC62 varies considerably with respect to both site area and stratum. Table 9-5 shows the distribution of unmodified bone, stone artifacts, lithic debitage, and bone and antler artifacts by stratum and by site area. Figures 9-4 and 9-5 illustrate the number of specimens recovered per cubic meter of fill excavated for each category of cultural material. Figure 9-4 compares the distribution of unmodified bone with that of bone and antler artifacts by stratum and by site area, while Figure 9-5 makes a similar comparison for stone artifacts and lithic debitage.

The overwhelming majority of the unmodified bone occurs in Stratum 2, regardless of site area; bone and antler artifacts are also distributed primarily in Stratum 2, although there is more variability between site areas with respect to bone and antler artifacts. It should be pointed out, however, that the sample size for the bone and antler artifacts is very small--more than an order of magnitude less than that for unmodified bone--and the variability between site areas may be largely a function of sample size.

Table 9-5. Distribution of unmodified bone and artifacts per cubic meter.

	Area A 1986			Area A 1989			Area B 1989		
	St 1	St 2	St 3	St 1	St 2	St 3	St 1	St 2	St 3
Cubic meters excavated	9.2	4.8	2.8	28.1	3.8	9.6	9.0	3.3	2.4
Unmodified bone (N)	1309	6319	92	326	4831	184	552	5589	51
Unmodified bone/m^3	142.4	1313.7	32.5	11.6	1284.8	19.2	61.2	1693.6	21.3
Debitage (N)	2321	853	62	909	255	370	380	250	70
Debitage/m^3	252.6	177.3	21.9	32.3	67.1	38.5	42.1	75.8	29.2
Bone/antler artifacts (N)	4	19	0	7	24	5	3	45	1
Bone/antler artifacts/m^3	0.4	4.0	0.0	0.2	6.4	0.5	0.3	13.6	0.4
Stone artifacts (N)	55	66	1	22	22	27	10	15	4
Stone artifacts/m^3	6.0	13.8	0.4	0.8	5.8	2.8	1.1	4.5	1.7

The lithic debitage shows greater variability with respect to stratum and site area than does the unmodified bone. Strata 1 and 2 (the non-shell deposit overlying the shell midden and the shell midden, respectively) yielded significantly greater amounts of debitage than did Stratum 3 (the non-shell deposit underlying the shell midden). The portion of Area A excavated in 1986 yielded more debitage than either Area A (1989) or Area B.

The stone artifacts are also variable in distribution, with the majority of them having been recovered from Stratum 2, and more of them recovered in the 1986 excavations than in the 1989 excavations. Again, the small sample size should be taken into account in interpreting the distribution of stone artifacts.

Two patterns are apparent from Table 9-5 and Figures 9-3 and 9-4. First, bone materials are strongly correlated with Stratum 2, regardless of site area. Second, non-perishable cultural materials are highly variable in their distribution within the site, with respect to both stratum and site areas. Taken together, these two observations suggest that bone is preserved better in the shell midden than in those portions of the site lacking shell.

PREHISTORIC SUBSISTENCE AT YAQUINA HEAD

Analyses of the vertebrate and invertebrate faunal remains from 35LNC62 indicate that the prehistoric inhabitants exploited a broad range of fish, birds, mammals, and shellfish from a variety of local habitats. The faunal analyses provide information regarding prehistoric diet, the range of habitats exploited, seasonal patterns in resource exploitation and site occupation and, to some extent, the types of technology that may have been employed by the prehistoric people who occupied the settlement on the headland.

Habitats Exploited

The molluscan analysis demonstrates intense exploitation of sea mussels available in the open coastal intertidal area below Yaquina Head. Other molluscan species indicating use of the open coastal intertidal zones were recovered in much smaller quantities. The exploitation of quieter, more protected waters, such as those of nearby Yaquina Bay may be indicated by the presence in the midden of small quantities of cockle, littleneck clam, butter clam, gaper clam, and macomas.

The fish fauna also indicate occasional exploitation of protected waters. As discussed in Chapter 5, the herring in the faunal assemblage almost certainly were harvested from Yaquina Bay. Tomcod may also have been caught in the bay. Extensive use of fish from nearshore open coastal habitats, presumably closer to Yaquina Head, is indicated by the presence of remains from greenling, buffalo sculpin and other sculpins, lingcod, rockfish, and surfperches, all of which are present in the rocky reefs below the headland.

Relatively large quantities of hake, the fish represented most commonly in the midden, are somewhat more difficult to interpret. It is possible that nearshore fishing of hake could have been accomplished with a hook and line but, generally speaking, hake are more of an oceanic fish, and onshore fishing of hake has not been reported near Yaquina Head. Large quantities of hake could be obtained by trawling farther from shore, in the inner continental shelf zone. In addition, natural die-offs of large numbers of hake occur, and it is possible that people took advantage of this phenomenon, and harvested dead or moribund hake that washed up on shore. Harrington (n.d.) reported that the Coos and Lower Umpqua Indians on the south-central Oregon coast caught hake in the ocean. He also reported that hake stranded on the beach were gathered and sold to hatcheries, where they were ground up and used for food; stranded hake were also used for fertilizer. Harrington made no mention of stranded hake being eaten by people, however.

Both marine and terrestrial mammals were hunted, most likely in the immediate vicinity of the headland. Sea otters, harbor seals, fur seals, and sea lions were probably hunted on offshore rocky islands; harbor seals and sea otters may have been captured on mainland beaches as well. Whales could have been hunted offshore as they migrated past the headland; in addition, or alternatively, beached whales may have been the source of the whale bone recovered from the site.

Neither deer nor elk, the two most commonly represented terrestrial mammals recovered from Yaquina Head, presently occupy the headland, having been eliminated by intensive human use of the area in recent years (Bureau of Land Management 1983:13). It is highly likely, however, that both of these large mammals were available within a fairly short distance of the site in prehistoric times.

The bird assemblage from Yaquina Head indicates significant exploitation of birds that are normally distributed some distance offshore. Together, albatross and fulmar make up one-third of the identifiable birds recovered during the 1989 season, and nearly 28% of the identified birds from the 1986 and 1989 seasons combined. Albatross and fulmar, as well as shearwaters, which make up an additonal 7% of the birds identified from the 1989 assemblage, are outer coast birds that are rarely sighted close to shore in Oregon.

There is some evidence that the short-tailed albatross occupied a slightly more inshore position than the Laysan and black-footed albatrosses currently do, but it was probably never a nearshore bird (see discussion in Chapter 5). Fulmars are reported to occasionally come near to shore along the California coast, following prey into kelp beds (Anthony 1895), but this does not appear to be a common practice. The relative abundance of these birds in the assemblage, and the fact that they co-occur in many of the same unit-levels suggests that they were

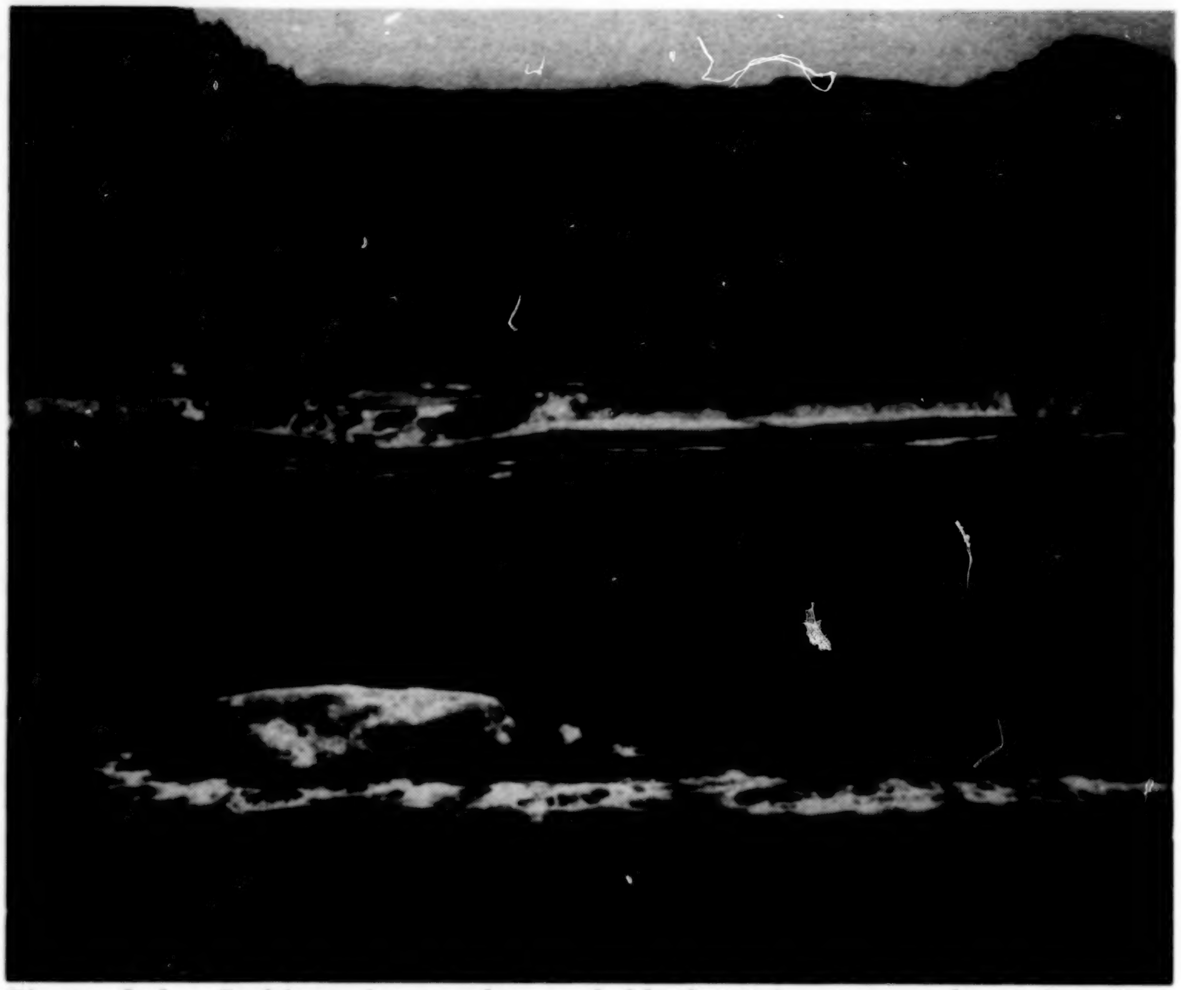


Figure 9-6. Prehistoric peoples probably hunted sea mammals at Otter Rock 6 km north of Yaquina Head.

probably deliberately hunted in a habitat where they predictably occur in significant numbers. This implies that the people who lived at Yaquina Head in prehistoric times had the will and the wherewithal to exploit offshore habitats.

Although it is possible that the birds represented in the cultural deposit are ones that were harvested after washing up dead or dying on the beach, it seems unlikely that such birds would have been used for food. It is difficult to imagine that quantities of albatross and fulmar sufficient to account for the numbers recovered would have washed up on the beach still in edible condition. This suggests, therefore, that unless albatross and fulmar had a significantly more inshore niche prehistorically than in historic times, the prehistoric inhabitants relied on ocean-going craft in order to exploit them.

The remainder of the bird assemblage reflects exploitation of birds available in the vicinity of the headland. The taxa most

Table 9-6. Summary of seasonal interpretation from bivalve growth ring analysis.

Species	Late Winter	Late Winter/ Early Spring	Early Spring	Late Spring	Spring/ Summer	Summer
Saxidomus giganteus	13	-	2	1	-	3
Clinocardium nuttalli	3	18	-	-	1	-
Protothaca staminea	5	-	-	-	-	-
Tresus capax	-	1	-	-	-	-
TOTAL	21	19	2	1	1	3

frequently represented include cormorants, white-winged scoter and other ducks, and common murres and other alcids.

Seasonality of Site Occupation

There are several indicators among the vertebrate faunal remains from Yaquina Head that suggest late summer/early fall exploitation of resources available off the coast of the headland (see Chapter 5). These indicators include adult male Steller sea lions, juvenile otariids, and immature birds. The fulmar, albatross, and shearwater remains could be interpreted to represent September-October procurement as well.

On the other hand, the fulmar may indicate winter or early spring exploitation. In addition, there are several winter indicators among the birds, including Pacific or red-throated loon, horned, western, and red-necked grebes, bufflehead, and rhinoceros auklet. Many of the birds that winter on the Oregon coast migrate to that region earlier in the year--in the fall, or even some in the late summer. It is possible, therefore, that these winter indicators may, in fact, represent fall procurement.

Thus, there is strong evidence to support vertebrate faunal resource procurement in the vicinity of Yaquina Head in the late summer and early fall. There is also evidence to suggest winter exploitation of various species, and many of the species present in the assemblage are available in the region throughout the year. Although the winter indicators are not unequivocal, and there are no exclusively spring indicators, the faunal assemblage as a whole is not inconsistent with the notion of year-round occupation of the headland.

In addition to exploitation of habitats at Yaquina Head, there are good indications that resource procurement in Yaquina Bay occurred in the late winter/early spring. As discussed in Chapter 5, Pacific herring (*Clupea harengus pallasii*) rarely occur in the intertidal zone, and do not currently come closer to Yaquina Head than Yaquina Bay, where they spawn. Herring spawn in Yaquina Bay from mid-January to early April, and their presence at 35LNC62 suggests a late winter/early spring use of Yaquina Bay by people who were living at the headland.

The results of the shellfish growth ring studies from both the 1986 and 1989 excavations, summarized in Table 9-6, strongly indicate late winter/early spring exploitation of cockle, littleneck, and butter clams (Minor et al. 1987:133-136; Chapter 4, this volume). While all three of these clam species have been collected in small quantities at Yaquina Head (Oregon Department of Fish and Wildlife 1987), they are much more common in the relatively protected waters of Yaquina Bay (U.S. Fish and Wildlife Service 1968:8). It is certainly possible that these specimens were collected near the headland. However, given that the presence of herring suggests people were exploiting resources in Yaquina Bay habitats in late winter/early spring, it is also possible that these specimens were collected from the bay and brought back to 35LNC62 by the site's inhabitants.

SITE 35LNC62 IN THE PREHISTORIC SETTLEMENT SYSTEM

Prehistoric hunter-gatherers like the people of the Southern Northwest Coast generally occupied a series of settlements during the course of a year. Typically, these settlements might include a central village occupied more or less throughout the year, and settlements occupied for shorter-terms for task-specific purposes, such as fishing and hunting camps. Determining the function of a given archaeological site in the prehistoric settlement system is often a difficult proposition, but there are several lines of evidence that, considered altogether, suggest that 35LNC62 was a prehistoric village. In drawing this conclusion, certain archaeological indicators of sedentariness (e.g., Rafferty 1985) observed at this site are briefly outlined below:

1. Site Location. Sedentary settlements tend to be located where resources are concentrated and abundant. The settlement at the tip of Yaquina Head seems to fit this situation. As reflected in the faunal assemblage, both vertebrate and invertebrate faunal resources were readily available in the immediate vicinity of the headland. The site's inhabitants apparently also exploited resources from other nearby habitats as well, including Yaquina Bay and more pelagic waters offshore.

2. Site Size and Depth. The presence of extensive and deep cultural deposits may be another indicator of sedentariness. The site is known to occupy an area of approximately 1300 square meters. The cultural deposits are generally 150-170 cm deep in Area A and 100-120 cm deep in Area B. In evaluating this village criterion, it should be kept in mind that much, if not most, of this site has eroded away, so that the original size of the settlement must have been much larger.

3. Artifact Variety. Sedentary settlements tend to contain an increased variety of artifacts because the entire range of yearly maintenance activities are carried out at these sites. The artifact assemblage from 35LNC62 exhibits such a variety, with artifacts reflecting procurement, processing, and especially manufacture and maintenance activities.

4. House Remains. Evidence of a semisubterranean pithouse was recovered during the 1986 investigations at 35LNC62. While no additional pithouses were found during the 1989 excavations, the extensive living surface uncovered in Area A also reflects intensive occupation.

5. Human Burials. The presence of human burials at prehistoric settlements may be another indicator of sedentariness. Two human burials were encountered at 35LNC62 during the 1986 project, and four more isolated human skeletal elements from at least three different individuals were collected during the 1989 investigations, bringing the total number of individuals known to have been interred at the site to five.

6. Seasonality of Faunal Remains. Seasonality information obtained from faunal remains may contribute to identifying the extent of sedentariness represented at archaeological sites (Monks 1981). As discussed above, the faunal remains from 35LNC62 indicate a very broad range of subsistence activities, and also suggest that the site was occupied during more than one time of the year, and conceivably year-round.

By themselves, any one of these criteria would not be sufficient to infer a village occupation. Considered altogether, however, these attributes make a compelling case for the conclusion that for most of its existence the settlement on Yaquina Head served as a village inhabited more or less throughout the year. If the Yaquina Bay resources were, in fact, obtained at a time when people were living at the headland (as opposed to being stored and brought to the headland later), then this would indicate not only winter occupation of the headland, but use of the site as a central place or village during the period of most intensive use of the settlement.

When does evidence of a village-level settlement appear at Yaquina Head? It now appears that only a few hundred years may have elapsed between the time of initial use of the headland, presumably involving temporary seasonal encampments, and the inception of intensive shellfish exploitation. Whether establishment of a village coincided with the inception of intensive shellfish exploitation, which commenced at approximately 3700 BP in Area B and 3200 BP in Area A, is uncertain.

However, some support for this idea was obtained during the 1986 investigations when an infant burial was encountered below a compact surface interpreted as a house floor in Area A. A radiocarbon assay of 3400 ± 240 RCYBP obtained from an associated whale bone artifact presumably indicates the approximate age of these features. This date fits nicely between the radiocarbon dates for initial exploitation of shellfish in Area A and Area B, and seems a reasonable age estimate for the establishment of the village at Yaquina Head.

SITE ABANDONMENT

In view of the fact that the rocky intertidal zone below Yaquina Head appears to be a productive environment for both molluscan and vertebrate resources at the present time, why was 35LNC62 abandoned by its prehistoric inhabitants? It seems reasonable to suggest that changes in the headland's environment, most likely as a result of erosional processes, may have led to the abandonment of 35LNC62. While coastal erosion is an ongoing process, it can also occur as mass movements, such as slumps and landslides. These processes may have intensified in conjunction with tectonic activity along the Cascadia Subduction Zone off the Southern Northwest Coast.

Recent geological studies indicate that earthquake-induced subsidence has resulted in the episodic submergence of coastal marshes and wetlands along the Southern Northwest Coast over at least the last several thousand years (Atwater 1987; Peterson, Darienzo, and Parker 1988; Darienzo and Peterson 1990). Direct evidence of coastal subsidence during the late prehistoric period is represented in the occurrence of archaeological sites with waterlogged components along the Oregon coast. The closest of these "wet sites" to Yaquina Head are to the north at 35TI1 on Netarts Bay (Newman 1959) and 35TI4 on Nehalem Bay (Woodward 1986).

Aside from direct inundation, it has been suggested that abrupt tectonic subsidence of the shoreline may have affected prehistoric coastal populations in other ways (Minor 1989c). Specifically, earthquake-induced subsidence may have altered coastal landforms (e.g., bays, spits, and river mouths). In turn, abrupt changes in shoreline elevation may have disrupted the distribution of marine shellfish, a resource on which coastal peoples depended to a considerable extent. In support of this idea, several recent archaeological studies have noted a coincidence in the timing of particular marsh submergence events and the abandonment of prehistoric coastal settlements (Minor 1989b, 1989c; Woodward, White, and Cummings 190; Darienzo 1991).

A similar coincidence of prehistoric occupation and marsh subsidence events is indicated in the distribution of radiocarbon dates from 35LNC50 on the north side of Yaquina Head (Minor 1989b). When compared with the buried marsh sequence from Netarts Bay (Peterson, Darienzo, and Parker 1988), it was found that all six dates from shell-bearing strata at this site fall between the dates of the first and second marsh subsidence events. The temporal distribution of these dates thus seems to indicate that deposition of the shell midden at 35LNC50 correlated with a period of relative stability in between these last two subsidence events. Occupation was discontinued sometime after 550 ± 60

RCYBP, a date that is sufficiently close to the age of the last subsidence event at 370 ± 60 RCYBP to suggest that the site may have been abandoned in response to a change in the local coastal environment resulting from an earthquake (Minor 1989b:77).

Comparison of the timing of local buried marsh sequences with the occupation span at 35LNC62 does not result in such a clearcut pattern. Because the Netarts Bay marsh sequence only extends back 3300 years, the longer marsh sequence now available from Alsea Bay (Peterson et al. 1991) to the south provides a more appropriate standard. In the Alsea Bay sequence, the earliest marsh submergence event has been radiocarbon dated to 4480 ± 80 RCYBP, and subsequent events during the span of the 35LNC62 occupation have been radiocarbon dated at 3140 ± 50 RCYBP, 2890 ± 70 RCYBP, 2620 ± 60 RCYBP, and 2210 ± 80 RCYBP. Thus, human occupation at 35LNC62 began after the earliest marsh submergence event, and persisted through at least three other events before ending around 2000 years ago.

If only the radiocarbon dates from Stratum 2, the shell midden, at 35LNC62 are considered, exploitation of shellfish would have taken place after the earliest marsh submergence event at 4480 ± 80 RCYBP, and continued through two events (at 3140 ± 50 RCYBP and 2890 ± 70 RCYBP) before ending at the approximate time of the fourth submergence event at 2620 ± 60 RCYBP. Indeed, it is noteworthy that the latest radiocarbon date of 2670 ± 70 RCYBP from Stratum 2 at 35LNC62 is statistically the same at that for the fourth submergence event. Occupation at 35LNC62 did, of course, continue after this time, as indicated by a later date of 2310 ± 60 RCYBP from Stratum 1, but the absence of shell in this stratum suggests that exploitation of molluscs may have ended sometime earlier.

Analysis of the shell middens did not reveal any noteworthy changes in shellfish exploitation patterns to indicate that the second (at 3140 ± 50 RCYBP) and third (at 2890 ± 70 RCYBP) marsh submergence events had any significant effects on the native inhabitants at 35LNC62. Sea mussels were by far the species of choice throughout the deposition of Stratum 2. It may be that these coseismic events were not intense enough to affect human occupation at the tip of the headland. Since bedrock is more resistant, earthquake-induced subsidence would presumably have less effect on headlands than on the low-lying beach and marsh areas along the coast.

In addition to erosion, changes in the headland's vegetation from coniferous forest to the present herb- and shrub-dominated plant communities almost certainly had an affect on the prehistoric inhabitants. Yaquina Head is usually windy, with constant velocities averaging 15 to 20 miles per hour most of the year. On occasion, winds reach velocities of 75 to 100 miles per hour (Bureau of Land Management 1983:10). In view of this situation, it is easy to imagine that the stand of coniferous forest in evidence on the headland before 4000 years ago was vitally important as a windbreak for the site's inhabitants. In conjunction with coastal erosion making access to the beach more difficult, any reduction in the size of the stand of trees would have contributed over the long run to the headland's becoming a less desirable setting for human occupation.

With the abandonment of 35LNC62, the prehistoric inhabitants presumably moved to other sites in more favorable locations, where subsistence resources were abundant and some protection from the elements was available. Use of sites 35LNC49 and 35LNC50 situated to the northeast in the lee of the headland may have begun in response to this abandonment (Minor 1989b). Although no chronometric dates have been obtained from 35LNC49, occupation of 35LNC50 has been radiocarbon dated to the interval from roughly 1400 to 500 years ago. Like 35LNC62 at the tip of the headland, occupation at 35LNC49 and 35LNC50 on the north side of Yaquina Head apparently ceased before the time of historic contact.

CHAPTER 10

YAQUINA HEAD IN OREGON COAST PREHISTORY

Archaeological investigations at 35LNC62 at the tip of Yaquina Head have contributed new and significant information about prehistoric occupation on the Southern Northwest Coast. Building on the results of previous excavations in 1986, the program of investigations in 1989 involved subsurface investigations across a large portion of the headland, resulting in a detailed picture of prehistoric occupation on Yaquina Head. This chapter begins with a review of the cumulative results of the two seasons of archaeological investigations at the tip of Yaquina Head. The chapter then turns to a consideration of the position of 35LNC62 in the regional culture sequence, with the objective of placing this important prehistoric settlement within the broader context of Southern Northwest Coast prehistory.

SUMMARY OF ARCHAEOLOGICAL INVESTIGATIONS

Specific research issues to be addressed during the 1989 investigations were outlined in Chapter 1. Identified as a result of the 1986 project, these research issues were specifically directed at questions about the setting and nature of human occupation at 35LNC62. It is useful to return to these research issues here, as a means of providing a summary of the information now available about prehistoric use of Yaquina Head.

Geomorphology

Previous geomorphological studies had identified three broad stratigraphic units on the marine terrace at Yaquina Head. The nature of these units suggested that significant geomorphic changes have occurred in the Yaquina Head vicinity. Two objectives of the 1989 investigations were to (1) establish the age ranges of these units, and (2) more firmly document changes in the geomorphology of the headland. The lowest of the three stratigraphic units, Unit D, is a sandy deposit overlying the basalt of the headland. This deposit underlies the archaeological remains and its age was not established. Its formation probably dates from the last interglacial, 80,000 to 125,000 years ago. Evidence of prehistoric occupation occurs within the two upper stratigraphic units. Radiocarbon dates indicate that Unit E, comprised of silty loam, was actively being deposited between 4000 and 6300 BP. Unit F, consisting of eolian sands, was actively being deposited between 2700 and 3700 BP.

Figure 10-1. View to the west of eroding cliff face with exposed shell deposit in Area A.

The suggestion that significant geomorphic changes have occurred in the Yaquina Head vicinity is inferred from the presence of eolian sand deposits perched on the high headland. These sand deposits presumably originated in the beach zone, but at Yaquina Head these deposits are not presently connected to the source beach. In order to account for their presence, the former existence of a sand ramp has been hypothesized. This sand ramp would have permitted sands to be blown by winds from the beach to the top of the headland. The absence of a sand ramp at this location at the present time can be accounted for by the post-glacial rise in sea level, which would have resulted in its destruction by erosion and wave action.

While it may never be possible to conclusively prove the former existence of a sand ramp at Yaquina Head, it is noteworthy that evidence of climbing sand dunes of the kind thought to have comprised the sand ramp were observed by the project geomorphologist at several other locations along the central Oregon coast. The inference that the coastline was significantly different, specifically in regards to beach access, during earlier prehistoric times is important, as it helps explain the existence of numerous prehistoric shell middens perched high on marine terraces with no present connection to the beach below.

Site Extent

Because the 1986 investigations were limited to one area of 35LNC62, another of the questions to be addressed during the 1989 project was whether other areas at the tip of Yaquina Head were occupied by prehistoric peoples as well. The results of the 1989 excavations indicate that evidence of prehistoric occupation actually occurs in three areas of Yaquina Head. In addition to the shell midden exposed along the headland's north face previously investigated in 1986 (Area A), the 1989 investigations documented the existence of a small shell deposit to the south (Area B), as well as evidence of light occupation in remnant dunes to the east (Area C). Radiocarbon assays indicate a somewhat earlier initial date for the shell deposit in Area B (3700 BP) in comparison with Area A (3200 BP), but overall the occupation of Area B appears to be roughly contemporaneous with that in Area A. No radiocarbon dates are available for the light occupation in Area C, but its occurrence in Stratigraphic Unit F suggests that it dates between 2700 and 3700 BP, roughly the same period as the later use of Areas A and B.

Cultural Components

On the basis of the 1986 investigations, the Yaquina I component was defined to encompass evidence of occupation in Stratum 3 underlying the shell midden. This component contained some evidence of the exploitation of marine fish, birds, and mammals, but appeared to differ from the later Yaquina II component in the apparent absence of intensive shellfish exploitation and its apparently greater age, estimated to range from 5000 and 3200 BP. Since only a small collection of artifacts had been recovered from Stratum 3, learning more about the nature and age of the Yaquina I component was one of the more important research issues confronting the 1989 investigations.

Instead of more firmly documenting the Yaquina I component, the results of the 1989 investigations suggest that distinguishing a separate component in Stratum 3 is no longer appropriate. Additional radiocarbon dating in conjunction with the 1989 project indicates considerable overlap in occupation of the separate areas and cultural strata at 35LNC62, resulting in a reinterpretation of use of the site in terms of a single more or less continuous occupation sequence.

Specifically, the earlier interpretation that Yaquina Head might have been occupied as early as 5000 years ago was based on a radiocarbon assay of 5030 ± 80 RCYBP obtained in conjunction with the 1986 project. Two more radiocarbon assays of 5140 ± 70 RCYBP and 5330 ± 110 RCYBP were obtained from deep burned zones during the 1989 investigations. All three assays were derived from extensive charcoal deposits that appear to represent evidence of widespread fires on the headland. In the absence of directly associated artifacts, these assays are now interpreted as predating human occupation. One other radiocarbon assay of 6350 ± 140 RCYBP is so much earlier than dates more firmly associated with human occupation as to also be suspect.

The most reliable radiocarbon dates for initial occupation of 35LNC62 are the assays of 4100 ± 60 RCYBP (Area A) and 4050 ± 60 RCYBP (Area B). While a basal stratum of occupation may be represented, it is now clear that relatively little time elapsed before intensive exploitation of shellfish began, as indicated by the earliest radiocarbon dates from the shell deposits of 3670 ± 70 RCYBP (Area B) and 3270 ± 70 RCYBP (Area A). In view of the considerable overlap in the radiocarbon assays from Stratum 3 and Stratum 2 (the shell midden), and the absence of distinctive artifactual or faunal data, it no longer seems worthwhile to attempt to distinguish more than one cultural component at Yaquina Head.

Village Occupation

The discovery of one apparent semisubterranean pithouse during the 1986 investigations led to the inference that 35LNC62 most likely served as a village during at least part of its occupation. Another important objective of the 1989 project was to more firmly document identification of 35LNC62 as a village. Specifically, it was hoped that more extensive excavations across the headland would encounter additional pithouses and/or other evidence of intensive occupation.

While no additional pithouses were found during the 1989 investigations, further evidence of intensive occupation was documented in the form of the extensive living surface uncovered in Area A. In addition, a number of other lines of evidence are available that suggest that 35LNC62 was a village: its key location near concentrated subsistence resources, its considerable size and depth, the high density as well as the variety of artifacts recovered, the presence of human burials, and the seasonality of the faunal remains. Considered altogether, these factors make a compelling case for concluding that 35LNC62 was a village for much, if not all, of its occupation by prehistoric peoples.

Site Abandonment

Based on the results of the 1986 project it was suggested that 35LNC62 at the tip of Yaquina Head was abandoned by 2000 years ago. Shoreline erosion and reduction in tree cover were cited as the most likely reasons for site abandonment. In view of the fact that more extensive excavations were planned for the 1989 investigations, the question naturally arose as to whether any evidence of prehistoric use of Yaquina Head after 2000 BP would be found. Whatever the ultimate date for cessation of occupation, a final important research issue pursued during the 1989 investigations involved an attempt to more firmly determine the cause of site abandonment.

The widespread excavations during the 1989 season did not find any evidence to contradict the previous suggestion that occupation at 35LNC62 ended sometime around 2000 years ago. No artifacts diagnostic of later times were recovered. The radiocarbon assay of 2310 ± 60 RCYBP obtained during the 1986 project remains the latest radiocarbon date from the site. The reason(s) that prehistoric peoples abandoned their village at tip of Yaquina Head may never be fully known, but a number of possible contributing factors have been suggested. Foremost among these factors is erosion of the hypothesized sand ramp by which sands from the beach came to be carried by winds to the top of the headland. Erosion of the sand ramp would have drastically affected access to resources in the intertidal zone below the headland. It is difficult to envision people hauling sea mammals (or even sea mammal parts) and large quantities of shellfish up from the beach unless access from the beach to the headland were considerably easier than it is today. Whether a result of eustatic sea level changes or possibly tectonic activity, it is ultimately clear that coastal erosion has resulted in the intertidal zone becoming less accessible from the top of the headland.

Reduction in tree cover was almost certainly another important factor that contributed to abandonment of 35LNC62. Identification of charcoal recovered from the cultural deposits and the small-scale pollen study carried out in conjunction with the 1989 investigations have firmly established that the headland was covered by coniferous forest before 4000 BP. Radiocarbon dating of charcoal samples indicates that the native inhabitants continued to burn coniferous species throughout the site occupation. At some point in time the vegetation on Yaquina Head underwent a change to the herb- and shrub-dominated plant communities characteristic of headlands along the Oregon coast since at least the beginning of the historic era. While speculative, it is reasonable to suggest that the cutting down and burning of trees by the native inhabitants facilitated this change in vegetation patterns. A reduction in tree cover, in turn, would have increased the exposure of the site to the strong winds and heavy rains characteristic of the Oregon coast, thereby making Yaquina Head a considerably less desirable place to live.

YAQUINA HEAD IN REGIONAL PERSPECTIVE

It has long been assumed that the earliest peoples of the Southern Northwest Coast were representatives of early interior cultures that reached the Pacific coast from the east. This assumption has been based primarily on the fact that early big game hunting cultures were established in the interior 10,000 to 12,000 years ago, while evidence of maritime cultures on the coast has dated many thousands of years later in time. Recently, however, shell middens containing occupations 9000-10,000 years old have been documented in southeast Alaska to the north and southern California to the south.

SOUTHERN NORTHWEST COAST CULTURE SEQUENCE

YEAR BP			Northern California	Southern Oregon	South-Central Oregon	North-Central Oregon	Northern Oregon	Columbia River	Southern Washington
Language Phylum			*Athapascan and Algic*	*Athapascan*	*Penutian*	*Penutian*	*Salish*	*Penutian*	*Salish*
Ethnographic People			*Wiyot* *Yurok* *Tolowa*	*Tututni* *Chetco*	*Coos* *Lower Umpqua* *Siuslaw*	*Alsea-Yaquina*	*Tillamook*	*Chinook*	*Lower Chehalis*
1,000	COASTAL ARCHAIC STAGE	LATE	Tsurai Point St. George II Patrick's Point Gunther Island	Pistol River Lone Ranch Creek Blundon II	Bullards Beach Bandon Philpott Umpqua/Eden II	Neptune Seal Rock North Yaquina Good Fortune Sites	Cronin Point Ti-1 Whale Cove II Par-Tee	Fishing Rocks Ivy Station	Minard Martin II
2,000 3,000		MIDDLE	Point St. George I	Blundon I Blacklock Pt. Myers Creek	Umpqua/Eden I Tahkenitch III	Yaquina II	Palmrose Whale Cove I	Eddy Point	Martin I
4,000 5,000		EARLY		Bluff Site Complex	Tahkenitch II	Yaquina I			
6,000 7,000 8,000 9,000	LITHIC STAGE	LATE			Tahkenitch I			Youngs River Complex	
10,000 11,000		EARLY			Siltcoos Lake Fluted Point Isolate				

Figure 10-2. Southern Northwest Coast culture sequence (from Minor 1989a).

As pointed out by Meighan (1989), these discoveries establish that maritime cultures are much older than previously thought, and provide support for the alternative view that, instead of having an interior origin, the earliest inhabitants may have been maritime peoples who reached the Southern Northwest Coast from the north. This issue--whether the earliest inhabitants were already maritime-adapted or were terrestrial-oriented hunters who later adapted to the coastal environment--is a very important one, as it directly influences our perception of the subsequent development of prehistoric cultures in this region.

In order to place 35LNC62 on Yaquina Head in regional perspective, a brief review of the cultural sequence on the Southern Northwest Coast is provided below. This review follows a recently proposed sequence of cultural stages that correlates cultural developments along the southern Washington, Oregon, and northern California coast (Minor 1989a). Temporal and spatial relationships of the major sites and complexes in this region are summarized in Figure 10-2.

LITHIC STAGE

As of this time, the earliest cultures along the Southern Northwest Coast are represented by lithic remains and, accordingly, these complexes are encompassed within the Lithic Stage. This stage can be subdivided into Early and Late substages. The early substage is apparently represented by a local manifestation of the continent-wide Fluted Point Horizon, generally assigned a timespan from 11,500 to 10,000 BP. This inference is based on the discovery of the basal portion of a Clovis point on the surface of an island in Siltcoos Lake on the central Oregon coast. This is the only fluted point so far reported along the coastal margin, but six other Clovis points and one Folsom point have been found farther inland between the Coast and Cascade ranges in Oregon (Minor 1985). A single Clovis point was also found near Olympia in the Puget Sound area of Washington (Osborne 1958).

The late substage is represented by assemblages featuring unfluted lanceolate projectile points in stemmed and shouldered as well as leaf-shaped forms. The best defined manifestation of this substage so far identified is the Youngs River Complex, which consists of stylistically early stone tools from the surface of terraces above southern tributaries near the mouth of the Columbia River (Minor 1984). The artifacts assigned to this complex are all stone tools surface collected from the Burkholder site on Youngs River, and include stemmed lanceolate and leaf-shaped projectile points, lanceolate knives and bifaces, various types of scrapers, cobble spall tools, bola stones, and baked clay items tentatively identified as netsinkers. Judging from the nature of the lithic remains, this complex represents an early population with a lifeway based primarily on hunting, with some evidence for fishing as well. Based on projectile point cross-dating, the Youngs River Complex is estimated to date between 10,000 and 6,000 BP.

Somewhat comparable assemblages have been recovered from so-called "bluff sites" found primarily along the southern Oregon coast. Situated on high marine terraces and headlands, these localities have been severely deflated by wind erosion, exposing lithic remains over large areas. The most extensive known bluff site, at Indian Sands, has yielded lanceolate and leaf-shaped points, as well as well-made bifaces, scrapers, gravers, and an abundance of cores and debitage (Berreman 1935; Pullen 1982). The absence of associated marine shell deposits has led to the suggestion that subsistence practices at bluff sites were focused primarily on terrestrial resources (Ross 1984). On the basis of the temporally-diagnostic projectile points represented, it seems likely that use of some bluff sites began as early as the Late Lithic substage, while occupation at others apparently continued well into the following Coastal Archaic Stage.

The temporal boundary between the Lithic and Archaic stages has not been firmly established. An apparently transitional adaptation has been documented at Tahkenitch Landing on the south-central Oregon coast (Minor and Toepel 1986). Situated on the shore of freshwater Tahkenitch Lake, this site was protected from rising sea levels by an extensive sand dune formation. Faunal remains and geomorphic evidence indicate that the site was adjacent to a marine estuary throughout its major periods of occupation. The earliest evidence of use (Tahkenitch I), recovered from a loamy sand deposit underlying a shell midden, is radiocarbon dated at 7960 ± RCYBP and 6880 ± 80 RCYBP (Minor and Toepel 1986:104).

While some fragments of marine shell occur in this early stratum at Tahkenitch Landing, the major subsistence focus was on fishing, particularly for staghorn sculpin, tomcod, hake, and flatfish. Hunting of birds, including ducks, cormorants, shearwaters, murres, and gulls, and mammals, including harbor seal and deer, was also conducted. Artifacts from this stratum were few in number, but include one scraper, one graver, three hammers, one chopper, and one sandstone abrader. The relative paucity of both molluscan and mammalian faunal remains, as well as the low number of artifacts recovered, suggests that during this period Tahkenitch Landing saw only limited seasonal use, most likely as a summer fishing camp.

The period preceding the appearance of shell middens is sometimes viewed as a Pre-Marine (Ross 1984, 1990) or Pre-Littoral (Lyman and Ross 1988) adaptive stage. This stage is believed to have been characterized by a terrestrial adaptation, with the implicit assumption that its practitioners had little knowledge of coastal resources. As discussed above, however, a variety of marine resources were already being exploited in the Tahkenitch I component between 8000 and 5200 BP (Minor and Toepel 1986). The fact that this evidence occurred within a cultural deposit in which shellfish were largely lacking emphasizes the important point that it is erroneous to assume that exploitation of marine resources necessarily involved accumulation of sizable shell middens. In view of the fact that early maritime peoples were already established in Alaska to the north and in California to the south, it seems reasonable to suggest that evidence of a similar early maritime lifeway is yet to be found along the Southern Northwest Coast.

COASTAL ARCHAIC STAGE

The Coastal Archaic Stage reflects an apparent expansion in the exploitation of coastal resources, reflected most obviously in the occurrence of marine shell middens. The temporal boundary between the Lithic and Coastal Archaic stages has not been firmly established. Using the earliest known shell midden (Tahkenitch Landing) as a reference point, the onset of Archaic lifeways along the Southern Northwest Coast is currently dated at 5500-5000 BP (Minor 1989a). Needless to say, the temporal boundary between the two stages is highly tentative, and is indeed subject to change with the discovery of even one earlier shell midden. The Coastal Archaic Stage has in turn been subdivided into Early (5500-3500 BP), Middle (3500-1500 BP), and Late (1500 BP-historic contact) substages.

Early Archaic Substage

Occupation during the Early Archaic has so far been documented at only two localities. The earliest evidence of the intensive exploitation of molluscan resources so far found occurred in the Tahkenitch II component at Tahkenitch Landing (Minor and Toepel 1986). Charcoal from the lowest of three shell-bearing strata at this site produced a radiocarbon assay of 5100 ± 70 RCYBP. Molluscan remains from this deposit, as well as later shell strata, consisted overwhelmingly of bay clams and bay mussels, confirming the former existence of an estuarine environment in today's freshwater lake. Fishing continued to be the most important subsistence activity, with sculpin, tomcod, flatfish, herring, and surfperches all strongly represented among the vertebrate faunal remains. Artifacts recovered from this earliest shell-bearing stratum are limited to one hammer, a pipe fragment, an antler wedge, and one clam shell tool. Aside from the additional exploitation of shellfish, use of this site apparently differed little from the preceding Tahkenitch I component.

The only other locality so far known to have been occupied during the Early Archaic is 35LNC62 at Yaquina Head. The earliest accepted radiocarbon dates from this site, 4100 ± 60 RCYBP from Area A and 4050 ± 60 RCYBP from Area B, place the initial use of the headland by native peoples near the end of the Early Archaic. Both of these radiocarbon dates are from Stratum 3 underlying the shell deposits. As discussed elsewhere in this report, there is considerable overlap in the radiocarbon dates from Stratum 3 and Stratum 2 containing the shell middens, and occupation of 35LNC62 is now interpreted in terms of a single more or less continuous sequence. As a result, there is no clearly defined cultural component at this site which correlates with the Early Archaic time period.

Middle Archaic Substage

The Middle Archaic, from 3500 to 1500 BP, is the first period during which shell midden occupations are widespread along the Southern Northwest Coast. All of the shell-bearing sites have produced artifact assemblages containing both stone and bone/antler tools. Stone projectile points include specimens in both the dart and arrow size ranges, indicating that the transition in weapon systems from the earlier atlatl and dart to the later bow and arrow began during this period.

Clearly, the bulk of the occupation at 35LNC62 at the tip of Yaquina Head took place during the Middle Archaic, as 13 of the 18 accepted radiocarbon dates fall within this interval. This locality is not the only site interpreted to represent a village-level occupation during this period, as shell middens thought to represent villages have also been reported at the Palmrose site on the north coast (Phebus and Drucker 1979), in the Tahkenitch III component at Tahkenitch Landing (Minor and Toepel 1986) on the south-central coast, and at the Myers Creek site on the south coast (Cressman 1977:194-195).

In addition to shell middens, a number of "bluff sites" along the southern Oregon and northern California coast were occupied during the Middle Archaic, as indicated by radiocarbon dates from Point St. George (Gould 1966, 1972), the Blundon site (Minor, Beckham, and Greenspan 1980), and Blacklock Point (Ross 1984). Radiocarbon dates from these sites indicate occupations contemporaneous with those at nearby Middle Archaic shell-bearing camps and villages. It has been suggested that the non-shell-bearing bluff sites represent a separate population migrating from the interior to the Pacific Ocean (Ross 1984). Given that prehistoric hunter-gatherers typically occupied a series of settlements throughout the year, however, a more parsimonious explanation is that non-shell-bearing localities that are contemporary with nearby shell middens simply represent different site types in the same settlement-subsistence system (Minor and Toepel 1983:222; Minor et al. 1987:146-149).

The time range encompassed within the Early and Middle Archaic substages (5500-1500 BP) roughly coincides with what has been referred to as the Early Littoral Stage of adaptation, "when subsistence strategies were focused on coastal, especially inter-tidal, resources" (Lyman and Ross 1988:100). This stage, as well as the succeeding Late Littoral Stage, are viewed as representing "cultures which depend heavily on the sea as a source of resources, but which do not possess the sophisticated technology (seaworthy boats, for example, in the sense of Hudson 1981) to use the open ocean as a hunting and fishing area" (Lyman and Ross 1988:96). This view, in which the prehistoric inhabitants are largely shorebound, is directly contradicted by faunal evidence from the Tahkenitch III component at Tahkenitch Landing as well as from 35LNC62 on Yaquina Head.

At Tahkenitch Landing, the recovery of over a thousand bones of Pacific hake, fish that rarely enter estuarine environments and more commonly school near the ocean bottom, strongly suggests the use of seacraft by the site's inhabitants. At Yaquina Head, the frequent occurrence in the faunal assemblage of seabirds (albatross, shearwaters, and fulmars) that share the same offshore habitat along the outer coast similarly suggests that prehistoric peoples possessed the technology and the desire to exploit offshore resources.

Further support for this inference has recently been reported in the form of evidence of occupation on Hunters Island off the southern Oregon coast. While no shell or faunal remains were observed, stone tools were seen eroding from a cultural stratum exposed by erosion. Charcoal from this stratum produced a radiocarbon assay of 1840 ± 70 RCYBP, indicating use of the island near the end of the Middle Archaic interval (Guard 1990:109). Thus, there is considerable reason to believe that the prehistoric inhabitants of the Southern Northwest Coast were exploiting offshore resources at least by Middle Archaic times.

Late Archaic Substage

The Late Archaic, from 1500 BP to historic times, is the best known period in Southern Northwest Coast prehistory. Overall, at least 30 major sites are known to have been occupied during this period, more than two dozen of which have actually been radiocarbon dated to this interval. Continuity in occupation from the Middle Archaic into the Late Archaic is relatively rare, and in the few cases where sites do contain multiple components there is usually a stratum change indicative of differences in site use. Most Late Archaic sites, then, are newly occupied, and of these a majority continued to be inhabited into the historic period. This situation thus suggests that ethnographic settlement patterns and lifeways largely emerged during this period.

To a considerable extent, the basic toolkit associated with coastal adaptation in use during the Middle Archaic was carried over into the Late Archaic, as most of the same classes of stone, bone/antler, and shell tools continued to be made. Large stone atlatl dart points continued to occur during the early part of this period, but by approximately 1000 years ago were replaced by small points used with the bow and arrow. The persistence of the atlatl and dart weapon system well past the time of the introduction of the bow and arrow may have been due to its specialized use in sea mammal hunting. Co-occurring with the small arrow points is a distinctive type of large triangular, concave based projectile point believed to have been used to tip harpoons employed in the hunting of sea mammals (Lyman, Clark, and Ross 1988). The use of mauls and hopper mortars was more widespread during the Late Archaic. While difficult to quantify because of the vagaries of sampling, there appears to be a trend toward greater artifact frequencies in Late Archaic sites, especially in terms of decorated and nonutilitarian items.

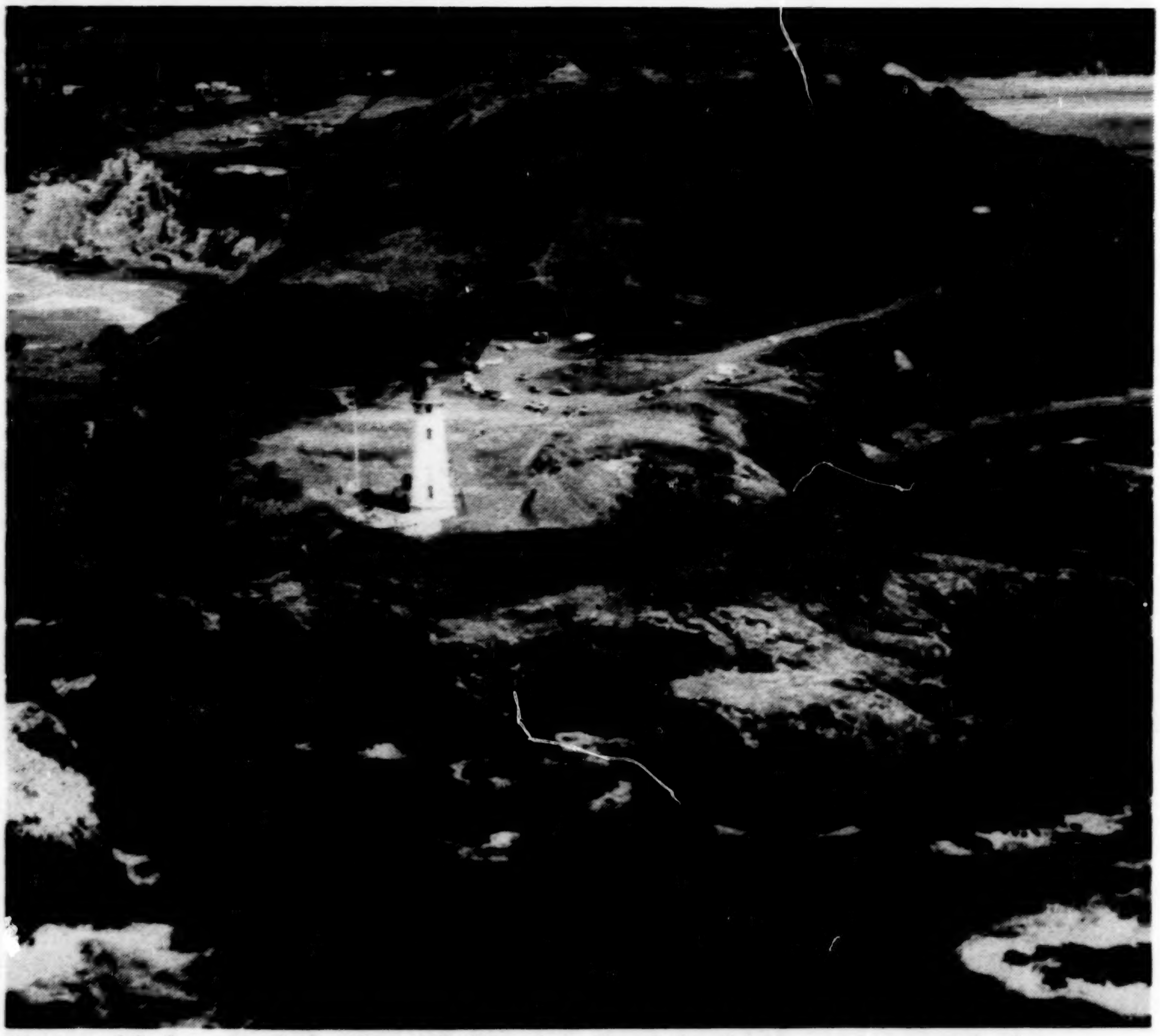


Figure 10-3. Aerial view of Yaquina Head looking east toward the mainland.

Chronologically, the Late Archaic coincides with what has been referred to as the Late Littoral Stage of adaptation (Lyman and Ross 1988:100), described as a continuation of the Early Littoral Stage, but with larger and more permanent settlements. It is suggested that a shift in adaptive strategies occurred, perhaps due to increasing population, that may have led to intensification in the exploitation of marine resources. As with the Early Littoral Stage, the Late Littoral Stage carries on the view of the prehistoric inhabitants as essentially shorebound.

While it is true that less evidence of offshore activities has been reported from Late Archaic sites, this situation is very likely due, at least in part, to the fact that faunal assemblages from Late Archaic sites have not been as intensively analyzed. In particular, fish and birds, which may be better indicators of offshore activities than sea mammals, have not been identified as thoroughly in Late Archaic faunal assemblages.

That exploitation of offshore resources did take place during Late Archaic times, however, is clearly indicated by the results of recent test excavations on Goat Island off the southern Oregon coast. Stone and bone artifacts as well as faunal remains from mammals, birds, and fish were recovered from a marine shell midden. Charcoal from this deposit produced a radiocarbon assay of 880 ± 50 RCYBP (Guard 1990: 101). It thus seems likely that further evidence of offshore activities will be found during future investigations of Late Archaic sites.

CONCLUSIONS

Site 35LNC62 at the tip of Yaquina Head is the most extensively investigated Middle Archaic settlement so far reported along the Southern Northwest Coast. With an occupation spanning the interval from roughly 4100 to 2000 BP, this site has provided information about an earlier cultural pattern in this region before the emergence of ethnographic cultures during Late Archaic times. This information has contributed directly to clarifying the nature of the adaptations practiced by the prehistoric peoples of the Southern Northwest Coast during Middle Archaic times.

Previously suggested "adaptational stages" proposed for the Oregon Coast, and by extension the Southern Northwest Coast in general, embrace the idea that the earliest inhabitants along this section of the Pacific Coast were "terrestrial-oriented" interior peoples who went through a series of changes in subsistence orientation to become adapted to living along the coastal margin (Ross 1984, 1990; Lyman and Ross 1988). In this model even the late prehistoric Southern Northwest Coast peoples are considered simple "littoral cultures" that lacked "the sophisticated technology....to use the open sea as a hunting and fishing area" (Lyman and Ross 1988:96). In this view, the prehistoric peoples of the southern Washington, Oregon, and northern California coast never became maritime-oriented, even though maritime cultures existed in British Columbia and Alaska to the north and farther south in California.

The adaptational stages model is not in accord with information currently available about prehistoric Southern Northwest Coast cultures. While the nature of the adaptation of the earliest inhabitants is not yet known, it is clear that marine resources were being exploited by roughly 8000 years ago, with shell middens in evidence by 5000-5500 years ago. Indirect evidence of offshore exploitation of marine resources is available by 3500-3000 years ago, and occupation on an offshore island has been found dating to 900 years ago. It is thus becoming increasingly evident that prehistoric peoples along the Southern Northwest Coast did, in fact, exploit offshore resources in a significant fashion. While much remains to be learned, the picture emerging from the archaeological record points to a more technologically sophisticated and dynamic prehistoric population along the Southern Northwest Coast than has previously been suggested.

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APPENDIX:

AUGER HOLE DATA SUMMARY

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AUGER HOLE DATA SUMMARY

This appendix provides a summary of the results of the auger testing program carried out at 35LNC62 on Yaquina Head in 1989. Table format follows the auger hole data summary provided in the 1986 project report (Minor et al. 1987:Appendix).

Stratum designations generally follow those employed during the 1986 and 1989 excavations:

0 - historic overburden
1 - cultural deposit above shell
2 - shell midden
3 - cultural deposit below shell

It should be noted, however, that because auger holes provide only a small glimpse of subsurface deposits, it was sometimes difficult to assign auger levels to the cultural and natural strata more fully exposed in excavation units. In particular, as in the unit excavations, when shell was absent it was often difficult to tell where Stratum 1 ended and Stratum 3 began .

It should also be noted that 48 of the 78 auger holes were situated outside the boundaries of the archaeological site. The designation NC, for non-cultural, was applied to strata observed in these holes.

Table A-1. Auger hole data summary for 35LNC62, 1989 season.

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
A1	0-30 cm	0	road gravels in medium brown silty loam	paint chips, glass, bolt, hinge some shell
	30-70 cm	0	medium brown fine sandy loam	paint chips, 1 shell fragment
A2	0-10 cm	0	medium brown silty loam	1 basalt flake, shell
	10-60 cm	0	same with gravels	shell, bullet, wood, glass, brick?
	60-170 cm	1	medium brown sandy loam	none
	170-200 cm	3	dark brown sandy loam	charcoal
	210-220 cm	3/4	same with sandstone concretions	charcoal
	220-250 cm	3/4	medium brown silt with orange sandstone	none
A3	0-60 cm	0	medium brown silty loam with road gravels	shell, glass
	60-80 cm	1	medium brown fine sandy loam	charcoal
	80-90 cm	1	same	1 chert flake
	90-100 cm		same	none
	100-130 cm	3	dark brown fine sandy loam with clay qualities	shell, charcoal
	130-140 cm	3	same	charcoal
	140-160 cm	3/4	same with sandstone	charcoal
	160-170 cm	3/4	yellow-clay sandy loam	none
	170-190 cm	4	yellow/brown clayish sandy loam	none
	190-220	4	same with sandstone	none
A4	0-20 cm	0	medium brown silty loam	shell, crockery
	20-50 cm	0	same with road gravels	shell
	50-90 cm	1	fine medium dark brown sandy loam with sandstone	none
	90-130 cm	3	red to dark brown sandy loam with clay, sandstone	none
	130-160 cm	3/4	yellowish clay loam	none
	160-200 cm	4	same with some sandstone	none
A5	0-10 cm	0	medium brown silty sandy	none
	10-50 cm	0	same with road gravels	charcoal, 1 shell
	50-60 cm	2	shell midden	shell
	60-70 cm	2	same	FCR, shell, 1 basalt flake
	70-100 cm	2	shell midden	shell, FCR, bone
	100-110 cm	3	lighter brown sandy loam	charcoal, little shell
	110-130 cm	3/4	same with sand concretions	charcoal, little shell
	130-160 cm	3/4	light brown with orange sand chunks	shell, charcoal
	160-170 cm	3/4	orange brown silty sand	FCR, charcoal
	170-180 cm	3/4	orange brown silty sand	charcoal
	180-220 cm	4	orange sand	charcoal
A6	0-40 cm	0	medium brown sandy loam with road gravel	none
	40-50 cm	2	shell midden	shell, 1 chert flake FCR, bone, charcoal
	50-60 cm	2	same	shell, FCR, charcoal bone, 1 worked bone
	60-80 cm	2	same	shell, FCR, bone charcoal
	80-90 cm	3	same with little shell	shell, 1 chert flake

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
A6	90-100 cm	3	same with little shell	shell
	100-120 cm	3/4	lighter soil, no shell	none
	120-140 cm	4	orange sand	none
A7	0-50 cm	0	medium brown silty sand with road gravels	none
	50-90 cm	1	dark brown sandy loam	charcoal
	90-100 cm	2	same with a little shell	shell, FCR, charcoal 1 chert flake, bone
	100-110 cm	2	shell midden	shell, FCR, charcoal, bones
	110-120 cm	2	same	shell, bone, charcoal 1 chert flake, FCR
	120-130 cm	2	same, but less shell	shell, bone, FCR charcoal
	130-140 cm	3	same, with little shell	shell, charcoal 1 chert flake
	140-150 cm	3	dark brown sandy silt	charcoal
	150-160 cm	3	same	1 basalt flake
	160-180 cm	3	same	charcoal
	180-190 cm	3/4	same with sandy chunks	charcoal
	190-220 cm	4	orange brown sand	none
A8	0-50 cm	0	medium brown sandy loam with road gravels	plastic
	50-80 cm	1	dark brown sandy loam	none
	80-90 cm	3	same, but very dark	none
	90-100 cm	3	same	3 chert flakes
	100-160 cm	3	very dark brown sandy loam	2 flakes
	160-210 cm	3/4	same with orange sand chunks	charcoal
	210-230 cm	4	compact orange sand	none
A9	0-40 cm	0	medium brown silty sand with road gravels	none
	40-90 cm	NC	medium/dark brown sandy loam	none
	90-130 cm	NC	becoming darker	none
	130-150 cm	NC	more clay	none
	150-160 cm	NC	same with orange sand	none
	160-170 cm	4	compact orange sand	none
A10	0-70 cm	0	medium brown sandy loam with road gravels	brick
	70-140	NC	same without road gravels	none
	140-210 cm	NC	dark brown sandy clay loam	none
	210-230 cm	NC	gray clay/sand	none
	230-250 cm	NC	blue-clay chunks	none
A11	0-130 cm	NC	medium brown fine silty sandy loam	none
	130-170 cm	NC	dark brown sandy clay loam	none
	170-240 cm	NC	darker brown with clay	none
	240-250 cm	4	yellow clayish sandy loam	none
	250-260 cm	4	orange clayish sandy loam	none
B1	0-30 cm	0	medium brown silty loam with gravels	plastic
	30-60 cm	NC	same, but no gravels	tape, glass
	60-130 cm	NC	same	none
	130-140 cm	NC	dark brown silty loam with more clay	none
	140-230 cm	NC	dark brown silty clay loam	none
	230-240 cm	NC	same with yellow sand	none
	240-250 cm	4	yellow sandy loam	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
B2	0-20 cm	0	medium brown sand with gravels	none
	20-50 cm	NC	same	some shell
	50-70 cm	NC	same	no shell
	70-130 cm	NC	fine medium brown sand	none
	130-140 cm	NC	medium brown sandy loam	none
	140-150 cm	NC	same	charcoal flecks
	150-220 cm	NC	same	none
	220-230 cm	NC	darker with more clay	none
	230-240 cm	NC	dark brown clayish sand with orange sandstone	none
C1	0-110 cm	NC	medium brown sandy loam	none
	110-120 cm	NC	same	charcoal
	120-200 cm	NC	same	none
	200-220 cm	NC	very dark brown sandy silt with some clay	none
	220-230 cm	NC	same	charcoal
	230-240 cm	NC	same, some grey clay	charcoal
	240-250 cm	NC	grey clay	none
C2	0-90 cm	NC	medium brown sandy loam	none
	90-100 cm	NC	same	charcoal
	100-150 cm	NC	same	none
	150-160 cm	NC	darker, more clay	none
	160-170 cm	NC	same	metal
	170-180 cm	NC	same	none
	180-230 cm	NC	dark brown sandy clay	none
	230--240 cm	NC	gray clay/sand	none
	240-250 cm	NC	compact grey clay	none
C3	0-90 cm	NC	medium brown sandy loam	none
	90-100 cm	NC	same	charcoal
	100-130 cm	NC	same	none
	130-160 cm	NC	darker, more clay	none
C4	0-40 cm	0	medium brown fine sand with gravels	none
D1	0-40 cm	0	medium brown sandy loam with gravels	none
	40-70 cm	NC	same, no gravels	none
	70-80 cm	NC	becoming lighter	none
	80-100 cm	4	orange sand	none
D2	0-40 cm	NC	medium brown sandy loam	none
	40-90 cm	NC	becoming darker	none
	90-120 cm	NC	orange-brown sandy loam	none
	120-150 cm	4	orange sand	none
	150-180 cm	NC	grey clay	none
D3	0-110 cm	NC	medium brown silty loam	none
	110-130 cm	NC	same, but more clay	none
	130-240 cm	NC	dark brown sandy clay	none
	240-250 cm	NC	same with yellow sandstone	none
D4	0-40 cm	NC	medium brown sandy loam	none
	40-70 cm	NC	same	charcoal
	70-80 cm	NC	same	none
	80-90 cm	NC	same	charcoal
	90-110 cm	4	orange sand	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
D5	0-10 cm	0	medium brown silty loam with gravels	shell
	10-20 cm	NC	same	none
	20-40 cm	NC	same with clay-like rocks	none
D6	0-20 cm	0	road gravels	none
	20-30 cm	0/4	gravels and compact orange sand	none
E1	0-20 cm	0	medium brown sandy loam with gravels	none
	20-40 cm	NC	same, but no gravel	none
	40-50 cm	NC	becoming darker	none
	50-80 cm	NC	dark brown sandy loam	none
	80-90 cm	4	compact orange sand	none
E2	0-20 cm	0	road gravels	none
F1	0-10 cm	0	sandy loam, some gravel	none
	10-60 cm	1	medium brown sandy loam	glass, metal, a little shell
	60-100 cm	1	same	charcoal
	100-110 cm	3	same	charcoal, FCR 2 basalt flakes
	110-120 cm	3	same	FCR, charcoal 2 chert flakes
	120-130 cm	3	same	1 chert flake
	130-140 cm	3	same	FCR, charcoal 3 chert flakes
	140-150 cm	3	same	FCR, charcoal
	150-160 cm	3/4	same with orange sand chunks	FCR
	160-180	3/4	light brown with orange sand chunks	none
	180-220	4	orange sand	none
F2	0-30 cm	0	medium brown silty loam with gravels	none
	30-80 cm	1	same with no gravels	none
	80-130 cm	2	shell midden	shell, charcoal, FCR bone, 1 hammerstone
	130-140 cm	3	dark brown sandy clayish	bone, charcoal
	140-190 cm	3	same	none
	190-200 cm	3/4	orange clay loam	FCR
	200-240 cm	4	same	none
F3	0-40 cm	0	medium brown silty loam with gravels	charcoal flecks
	40-110 cm	2	medium brown silty sandy loam	shell, tarpaper metal pipe, FCR, bone
	110-120 cm	2	same with clay and bits of sandstone	bone, shell, charcoal
	120-130 cm	3	dark brown sandy clay loam	charcoal
	130-150 cm	3/4	same with sandstone	charcoal flecks
	150-170 cm	4	same	none
	170-190 cm	4	orange clay sandy loam	none
	190-200 cm	4	same	1 FCR
F4	0-20 cm	0	medium brown sandy silt with gravels	none
	20-30 cm	0	same no gravels	FCR, shell, 1986 backdirt?

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
	30-60 cm	1	same	none
	60-70 cm	1	same	metal
	70-120 cm	2	shell midden	FCR, bone, shell
	120-150 cm	3	dark brown clay soil	shell, charcoal
	150-170 cm	3/4	same with orange sand	none
	170-190 cm	4	orange sand	none
F5	0-60 cm	0	medium brown silty sand with gravel	glass, metal, plastic some shell
	60-120 cm	1/2	darker with some shell	Used flake, bone, FCR shell, charcoal
	120-150 cm	3	dark brown silty sand	charcoal
	150-160 cm	3/4	light brown sandy silt with orange sand chunks	charcoal, FCR
	160-200 cm	4	orange sand	none
F6	0-40 cm	0	medium brown silty loam with gravels	glass, some shell
	40-60 cm	1	same, no gravels?	shell
	60-80 cm	1	medium brown silty sandy loam	shell, charcoal charcoal flecks
	80-90 cm	1	same, but with some clay	shell
	90-100 cm	3	same with some clay	FCR, charcoal 1 chert flake
	100-140 cm	3	dark brown silt loam with clay	bone, FCR, chracoal trace
	140-170 cm	3	same with some sandstone	charcoal
	170-180 cm	3	same but no sandstone	charcoal, shell flecks
	180-190 cm	3	same with some sandstone	charcoal, shell flecks
	190-200 cm	3/4	same, sandstone increase	none
	200-210 cm	4	orange/yellow sandstone	none
F7	0-20 cm	0	medium brown sand with gravels	historic materials
	20-40 cm	1	same, a little shell	thin lens of shell
	40-60 cm	1	darker soil with gravels	little shell
	60-80 cm	1	same, few gravels	none
	80-90 cm	2	shell midden	shell, FCR
	90-100 cm	2	same	shell, bone, charcoal 1 basalt flake, FCR
	100-110 cm	2	same	shell, FCR, charcoal bone, 1 basalt flake
	110-120 cm	3/4	same with orange sand chunks	Shell, FCR, charcoal bone
	120-130 cm	3/4	same, more sand chunks	FCR, bone, shell 2 basalt flakes
	140-170 cm	3/4	medium brown sandy loam	charcoal, FCR
	170-180 cm	3/4	compact orange sand	charcoal, FCR
F8	0-40 cm	0	medium brown sandy loam with gravels	plastic, metal, some shell
	40-60 cm	1	dark brown sandy loam	metal, little shell
	60-160 cm	1/3	same	FCR, charcoal
	160-170 cm	3	lighter soil	none
	170-190 cm	4	orange sand	none
F9	0-30 cm	1	medium brown sandy loam	none
	30-50 cm	1	medium brown silty sandy	glass, FCR, 1 shell
	50-70 cm	1	loam becomes darker	none
	70-130 cm	3	dark brown sandy clay loam	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
	130-140	3/4	mixture of colors with higher clay content	none
	140-170	4	same with yellow/orange sandstone	none
F10	0-40 cm	0	medium brown sandy loam with gravels	none
	40-50 cm	NC	same, less gravel	metal
	50-90 cm	NC	dark brown sandy loam	none
	90-110 cm	4	orange sand	none
F11	0-40 cm	0	light brown sand with gravels	none
	40-70 cm	NC	very light brown sand	metal, glass
	70-120 cm	NC	same	charcoal
	120-140 cm	NC	yellow sand	metal, charcoal
	140-150 cm	NC	becoming more orange	metal, plastic charcoal
	150-160	4	compact orange sand	metal, charcoal
F12	0-50 cm	0	medium brown silty loam with gravels	brick, plastic, shell
	50-70	NC	same, no gravels	coal
F13	0-30 cm	1	medium brown sand with gravels	none
	30-40 cm	NC	same	metal, coal
	40-50 cm	4	orange sand	none
G1	0-100 cm	NC	medium brown silty loam	none
	100-120 cm	NC	same with clay	none
G2	0-60 cm	NC	medium brown silty loam	none
	60-70 cm	NC	same	charcoal trace
	70-120 cm	NC	same	none
	120-150 cm	NC	same with more clay	none
	150-220 cm	NC	dark brown silt-clay loam	none
	220-250 cm	NC	same with orange sandstone	none
G3	0-20 cm	NC	medium brown sandy loam	none
	20-90 cm	NC	same	charcoal
	90-100 cm	NC	same	plastic, charcoal
	100-150 cm	NC	same	charcoal
	150-170 cm	NC	same	none
	170-180 cm	NC	becoming darker	none
	180-250 cm	NC	dark brown clay sand	none
G4	0-30 cm	NC	medium brown sandy loam	none
	30-40 cm	NC	same	a little charcoal
	40-90 cm	NC	same	none
	90-100 cm	NC	same	charcoal
	100-180 cm	NC	same	none
	180-250 cm	NC	dark brown clay sand	none
G5	0-110 cm	NC	medium brown silty loam	none
	110-120 cm	NC	same, with more clay	none
	120-170 cm	NC	dark brown clay sand loam	none
	170-200 cm	NC	same, more clay	none
	200-210 cm	NC	same, with yellow sandstone	none
	210-230 cm	NC	same with grey sand	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
G6	0-140 cm	NC	medium brown sandy loam	none
	140-200 cm	NC	dark brown clay sand	none
	200-210 cm	NC	yellow-tan sandy clay	none
G7	0-70 cm	NC	medium brown sand	none
	70-140 cm	NC	dark brown clay sand loam	none
	140-150 cm	NC	same, but more clay	charcoal flecks
	150-170 cm	NC	same	none
	170-180 cm	NC	same with orange sand	none
	180-190 cm	NC	yellowish-orange sand	none
H1	0-40 cm	0	light to medium brown sandy loam	glass, metal, nail a little charcoal
	40-180 cm	1	same	none
	180-190 cm	1	same	1 FCR
	190-200 cm	3	dark brown clay sand	none
	200-210 cm	3	same	large rock, charcoal
	210-230 cm	3	same	none
	230-250 cm	4	tan-orange sand/clay	none
H2	0-100 cm	0	medium brown sand with gravels	concrete, glass, plastic, shell
	100-140 cm	1	same	none
	140-200 cm	3	medium brown clay sand loam	none
	200-210 cm	3	same	charcoal flecks
	210-240 cm	3	same	none
	240-250 cm	3	same	charcoal flecks
H3	0-40 cm	NC	light brown sand	shell, charcoal flecks
	40-60 cm	NC	same	none
	60-70 cm	NC	same	pure charcoal
	70-90 cm	NC	yellow sand	none
	90-130 cm	NC	same	a little charcoal
	130-140 cm	NC	same	none
	140-190 cm	NC	same	charcoal
	190-200 cm	NC	same	none
	200-230 cm	NC	dark brown clay sand	charcoal
	230-255 cm	NC	same	big charcoal chunks
H4	0-10 cm	1	light brown sand	none
	10-20 cm	1	same	a little shell
	20-100 cm	1	same	a little charcoal
	100-210 cm	1	same	none
	210-260 cm	3	medium brown sandy loam	none
H5	0-100 cm	1	medium brown sandy loam	shell, FCR, charcoal flecks
	100-120 cm	1	same	none
	120-130 cm	3	somewhat more compact	charcoal flecks
	130-210 cm	3	same	none
	210-250 cm	3	dark brown sandy loam with increasing clay	none
H6	0-40 cm	0	angular road gravels	none
	40-120 cm	NC	medium brown sand?	none
	120-130 cm	NC	same	brick pieces
	130-170 cm	NC	same	none
	170-200 cm	NC	same	some charcoal
	200-210 cm	NC	same with orange sand	none
	210-240	NC	compact orange sand	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
H7	0-20 cm	1	fine medium brown sand	none
	20-30 cm	1	same	shell, FCR
	30-40 cm	1	medium brown sandy loam	none
	40-130 cm	1	same	plastic, foil, bark, nails, paint chips
	130-140 cm	1	same	none
	140-230 cm	3	medium brown sand	none
	230-250 cm	3	dark brown clay sand loam	none
H8	0-90 cm	NC	light brown sand	none
	90-110 cm	NC	same	charcoal trace
	110-130 cm	NC	same	none
	130-150 cm	NC	same	charcoal trace
	150-250 cm	NC	same	none
I1	0-10 cm	0	medium brown silty sandy loam with gravels	none
	10-20 cm	0	same	shell
	20-30 cm	NC	same with cobbles	shell, glass
	30-40 cm	NC	yellow sandstone with gravels	none
I2	0-20 cm	NC	light brown sand	none
	20-30 cm	NC	same with gravels	none
	30-40 cm	NC	angular rocks/orange sand	none
	40-50 cm	NC	same	historic
I3	0-30 cm	NC	brown sand	none
	30-50 cm	NC	same with gravels	none
	50-70 cm	NC	darker sand	none
	70-110 cm	NC	dark brown sand	none
I4	0-10 cm	NC	medium brown silty sandy loam with gravels	none
	10-20 cm	NC	same with orange sand	none
	20-40 cm	4	yellow-orange sand	none
I5	0-30 cm	NC	medium brown silty sandy loam	none
	30+ cm	4	yellow sandstone	none
I6	0-10 cm	NC	dark brown sandy loam	none
	10-20 cm	NC	same	shell, charcoal trace
	20-30 cm	NC	same	none
	30-40 cm	NC	same with orange sand	none
	40-50 cm	4	orange sand and rocks	none
I7	0-20 cm	NC	medium brown sandy loam	none
	20-30 cm	NC	same with gravels	none
	30-40 cm	NC	same, increase in gravel	none
I8	0-50 cm	NC	medium brown sandy silty loam	charcoal trace
	50-60 cm	NC	same with yellow sandstone	none
I9	0-30 cm	NC	light brown sand	none
	30-50 cm	4	orange sand	none
I10	0-60 cm	NC	medium brown silty sandy loam	charcoal
	60-70 cm	NC	same	none
	70-100 cm	NC	medium to dark brown clayish sandy loam	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
	100-140 cm	NC	same, with yellow sandstone	none
	140-200 cm	NC	same with clay increase	none
	200-220 cm	NC	same with yellow sandstone	none
	220-240 cm	4	yellow sand	sand
I11	0-40 cm	NC	light brown sandy loam	none
	40-60 cm	NC	same with charcoal pocket	charcoal
	60-90 cm	NC	same but more sandy	charcoal
	90-140 cm	NC	darker sandy loam	none
	140-160 cm	NC	same	charcoal specks
	160-180 cm	NC	same	none
	180-230 cm	NC	tan-yellow sandy clay	none
	230-250 cm	NC	same with grey clay	none
I12	0-60 cm	NC	medium brown sandy loam	none
	60-140 cm	NC	yellow sand	none
	140-180 cm	NC	grey-brown clay/sand	none
	180-210 cm	NC	dark brown clay/sand	none
	210-240 cm	NC	medium brown sand	none
	240-250 cm	4	orange sand	
I13	0-110 cm	NC	medium brown silty sandy loam	none
	110-120 cm	NC	same	charcoal
	120-130 cm	NC	same	none
	130-210 cm	NC	medium brown sandy clay loam	none
	210-240 cm	NC	same with more clay	none
	240-250 cm	NC	yellow sandy clay	none
I14	0-40 cm	NC	dark brown loam	none
	40-60 cm	NC	same with rocks	none
J1	0-30 cm	NC	road gravel	none
	30-140 cm	NC	medium brown loam	none
	140-220 cm	NC	dark brown loam	none
	220-240 cm	NC	yellow clay	none
J2	0-30 cm	NC	medium brown silty loam	none
	30-40 cm	NC	same	shell
	40-160 cm	NC	same	none
	160-210 cm	NC	dark brown sandy loam with some clay	none
	210-240 cm	NC	same with yellow sandstone	none
	240-250 cm	NC	tannish clay	none
J3	0-10 cm	NC	medium brown sandy loam	none
	10-20 cm	NC	same	plastic
	20-70 cm	NC	same	none
	70-80 cm	NC	same	charcoal trace
	80-150 cm	NC	same	none
	150-230 cm	NC	dark brown clay/sand	none
	230-240 cm	NC	same with orange sand	none
J4	0-70 cm	NC	medium brown silty loam	none
	70-110 cm	NC	same with mixture of darker clayish loam	none
	110-190 cm	NC	dark brown sandy clayish loam	none
	190-250 cm	NC	same with increasing clay	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
K1	0-30 cm	NC	brown loam with gravels	brick pieces
	30-130 cm	NC	medium brown loam	none
	130-150 cm	NC	dark brown clay sand	none
	150-200 cm	NC	darker midden-like soil	none
	200-210 cm	NC	lighter, with orange sand	none
	210-220 cm	NC	same	charcoal flecks
	220-240 cm	4	orange sand	none
K2	0-60 cm	0	medium brown silty loam with gravels	none
	60-100 cm	1	same, no gravels	none
	100-110 cm	3	dark brown sandy loam with some clay	1 obsidian flake
	110-120 cm	3	same	none
	120-130 cm	3	same	FCR, charcoal flecks
	130-140 cm	3	same	FCR, 1 shell piece
	140-150 cm	3	same	charcoal
	150-180 cm	3	same	none
	180-190 cm	3	same, increase in clay	none
	190-200 cm	3	same, some orange sandstone	none
	200-210 cm	4	yellow-orange sandstone	none
AA	0-60 cm	0	medium brown silty sand with gravels	none
	60-70 cm	1	same, no gravel	none
	70-80 cm	1	same	FCR, charcoal 1 chert flake
	80-90 cm	1	same	FCR, charcoal, 1 basalt flake
	90-110 cm	1	same	FCR, charcoal
	110-120 cm	3	dark brown silty sand	FCR, charcoal
	120-130 cm	3/4	dark brown silty sand with orange mottling	FCR, charcoal
	130-140 cm	3/4	medium brown silty sand with orange mottling and sandstone, increased clay	FCR
	140-150	4	orange sand	none
BB	0-40 cm	0	medium brown silt with road gravel	none
	40-50 cm	1	medium brown silty sand	charcoal
	50-60 cm	1	same	none
	60-80 cm	1	same with gravels	none
	80-90 cm	1	same	1 piece of shell
	90-100	2	shell midden	shell, charcoal, FCR
	100-110 cm	2	same	shell, charcoal, FCR 1 basalt flake
	110-140 cm	3	dark brown silty sand becoming more orange	charcoal
	140-160 cm	3	same, more orange	none
	160-170	4	orange sand	none
CC	0-10 cm	0	medium brown silt	none
(K3)	10-40 cm	0	same with gravels	none
	40-80 cm	1	medium brown silty sand	none
	80-90 cm	1	same	charcoal flecks
	90-100 cm	3	dark brown silty sand with orange sand chunks	charcoal flecks
	100-110 cm	3	same	charcoal flecks, 1 basalt flake
	110-130 cm	3	same	none
	130-150 cm	4	orange sand	none

Table A-1 (continued)

Auger Hole	Depth Below Surface	Stratum	Fill Description	Cultural Material
DD	0-50 cm	0	medium brown silt with gravels	none
	50-60 cm	1	medium brown silty sand	charcoal, 1 chert flake
	60-110 cm	1	same	charcoal, FCR
	110-130 cm	3	dark brown silty sand	charcoal
	130-140 cm	3	same, with sandstone	charcoal
	140-150 cm	3	same, more orange	charcoal
	150-160 cm	4	orange sand	none
EE	0-10 cm	0	medium brown silt	none
	10-60 cm	0	medium brown silt with gravels	none
	60-80 cm	1	medium brown silty sand with decreasing gravels	none
	80-90 cm	1	same	FCR, charcoal, 1 basalt flake
	90-110	2	shell midden?	shell, FCR, charcoal
	110-130 cm	3	dark brown silty sand	shell, FCR, charcoal, bone
	130-150 cm	3/4	dark brown silty sand with sandstone	charcoal
	150-160 cm	4	yellow sandstone	none

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Cultural Resource Series

1. Archaeological Investigations at Yaquina Head, Central Oregon Coast. Rick Minor, Kathryn Toepel and Ruth L. Greenspan. 1987.

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